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AERODYNAMIC CHARACTERISTICS AND SUBSONIC FLIGHT PERFORMANCE OF THE SPIN-STABILIZED, 4.2 INCH M329A1E1 MORTAR PROJECTILE

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An extensive study of the aerodynamic characteristics of the 4.2" M329A1E1 Mortar Projectile has been conducted. A spectrum of yaw levels up to 40° and Mach numbers from 0.55 to 1.025 were covered in the Ballistic Research Laboratories (BRL) Transonic Range Facility. A Magnus wind tunnel test in the Ames 12' Pressure Wind Tunnel involved boom and boattail effects on Magnus as well as static forces from moments. Mach numbers from 0.3 to 0.95 and angles of attack from 0° to 30° (for a Mach number of 0.3) and 0° to 20° (for the higher Mach numbers) were considered. Shells instrumented with yaw sondes were fired at Wallops Island Facility of NASA. The theoretical differential equation of motion then was fitted to the resulting single plane angular motion data.

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Dover, N.J.

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NOMENCLATURE

α	Angle of attack, degrees
β	Angle of sideslip, degrees
C_{D_o}	Axial force coefficient, $F_X/\bar{Q}S$
C_{l_p}	Roll damping moment coefficient, $L_p/\bar{Q}Sd\left(\frac{pd}{2V}\right)$
C_m	Pitching moment coefficient, $m/\bar{Q}Sd$
C_{m_α}	Pitching moment coefficient derivative, 1/rad
$C_{m_{\dot{\alpha}}}$	Flow lag moment coefficient, $m_{\dot{\alpha}}/\bar{Q}Sd\left(\frac{\dot{\alpha}d}{2V}\right)$
C_{m_q}	Damping moment coefficient, $m_q/\bar{Q}Sd\left(\frac{qd}{2V}\right)$
C_N	Normal force coefficient, $N/\bar{Q}S$
C_{N_α}	Normal force coefficient derivative, $\partial C_N/\partial\alpha$
C_{n_p}	Magnus moment coefficient, $n_M/\bar{Q}Sd\left(\frac{pd}{2V}\right)$
$C_{n_{p\alpha}}$	Magnus moment coefficient derivative, $\partial C_{n_p}/\partial\alpha$, 1/rad
C_{Y_p}	Magnus force coefficient, $F_Y/\bar{Q}Sd\left(\frac{pd}{2V}\right)$
$C_{Y_{p\alpha}}$	Magnus force coefficient derivative, $\partial C_{Y_p}/\partial\alpha$, 1/rad
d, D	Diameter, ft
F_X	Axial force, lb

I_x	Axial moment of inertia, slugs - ft^2
I_y	Transverse moment of inertia, slugs - ft^2
K_1	Magnitude of nutation arm, degrees
K_2	Magnitude of precession arm, degrees
L_p	Roll damping moment, ft-lb
λ_1	Quasi linear nutation arm damping factor, 1/sec
λ_2	Quasi linear precession arm damping factor, 1/sec
N	Normal force, lb
n_M	Magnus moment, ft-lb
F_Y	Magnus force lb
M	Mach number
m_q	Damping moment, due to pitching velocity, ft-lb
$m_{\dot{\alpha}}$	Flow lag moment, ft-lb
m	Pitching moment, ft-lb
p	Roll rate, rad/sec
$\bar{Q}$	Dynamic pressure, lb/ft^2
q	Pitch rate, rad/sec
QE	Quadrant elevation, mils or degrees, as noted
ρ	Air density, $slugs/ft^3$
s_g	Gyroscopic stability factor
S	Reference area, ft^2

1K

V	Free stream or flight velocity, ft/sec
θ	Sun angle, degrees
ω_1	Nutation frequency, rad/sec
ω_2	Precession frequency, rad/sec
XCG	Center of gravity location, calibers from nose
XCP	Center of pressure of normal force, calibers from the CG
XCPM	Magnus force center of pressure, calibers from center of gravity

<u>Subscripts</u>

o	Initial condition
f	Final condition
2	Indicates second order coefficient of Maple-Synge polynomial expansion

<u>Superscript</u>

*	Secant slope

ABSTRACT

An extensive study of the aerodynamic characteristics of the 4.2", M329A1E1 Mortar Projectile has been conducted. A spectrum of yaw levels up to 40° and Mach numbers from 0.55 to 1.025 were [illegible]ered in the Ballistic Research Laboratories (BRL) Transonic R[illegible] Facility. A Magnus wind tunnel test in the Ames 12' Pressure Wind Tunnel involved boom and boattail effects on Magnus as well as static forces and moments. Mach numbers from 0.3 to 0.95 and angles of attack from 0° to 30° (for a Mach number of 0.3) and 0° to 20° (for the higher Mach numbers) were considered. Shell instrumented with yaw sondes were fired at the Wallops Island Facility of NASA. The theoretical differential equation of motion then was fitted to the resulting single plane angular motion data.

INTRODUCTION

The M329A1E1 projectile is the result of an accelerated product improvement program with the objective to provide a replacement for the M329A1 projectile. Because of the accelerated nature of the program only the improvements which are within the current state of the art have been incorporated. Figures 1 and 2 are drawings of the M329A1E1 and the M329A1 projectiles. The subcaliber cylindrical sections contain the ignition cartridge; they appreciably affect the aerodynamic characteristics of the shell.

The 4.2", M329A1 has been in use since 1940. Its extension to the cartridge housing was part of an attempt to upgrade the system performance by increasing the chamber volume and enabling the use of larger charges. The M329A1 has a history of occasionally erratic flights, the propensity for which increases when the extension to the cartridge housing is present. This extension generates a larger Magnus moment than the original short boom configuration and can lead to dynamic instabilities.

Several improvements have been incorporated into the M329A1E1 design. The drag is decreased by replacing the square base of the M329A1 by a 0.65 caliber boattail and adding a longer windshield. A fixed pre-engraved rotating band has been incorporated into the new design in an attempt to improve the spin performance. A constant chamber volume propellant system makes it possible to eliminate the extension to the cartridge housing.

Cumulatively, these configurational changes mean an improvement of the M329A1E1 in both high and low range capability.

TEST FACILITIES

BRL Transonic Range

The M329A1E1 projectile was fired at subsonic and low transonic velocities in the Ballistic Research Laboratories (BRL) Transonic Range Facility described in Reference 1.

NASA Ames 12' Pressure Wind Tunnel

The Ames 12' Pressure Wind Tunnel is a variable-density, low-turbulence tunnel that operates at subsonic speeds up to slightly less than Mach number 1.0. It is powered by a two-stage axial-force fan driven by electric motors. Airspeed in the test section is controlled by variation of the rotational speed of the fan. Eight fine mesh screens in the settling chamber together with the large contraction ratio of 25 to 1 provide an airstream of exceptionally low turbulence. A special mounting drive system was available for angles of attack over 20°. Figure 3 is a plot of the operating characteristics of this wind tunnel. The full scale test configurations and strain gage balance beams were constructed by the Supersonic Wind Tunnel Branch of BRL. The two beams prepared for the test are SB228A and backup beam SB228B, but only the former was used. They are five component strain gage balances, each of which has two pitch gages and three yaw gages specifically designed for the forces and moments anticipated in this test. The exterior of the model consisted of three basic parts.:

a. Ogive and cylindrical section

b. Tail section (square base or boattail)

c. Boom

Model designations are as follows:

Designation	Drawing Number	Item
NB	SSK2590B - 1 SSK2590A	M329A1E1 nose and cylindrical body
T_1	SSK2590 - B2	Boattail on the aft 0.65 calibers of the model
T_2	SSK2590 - B3	Square base (same length as boattail)
C_1	SSK2590 - B4	Cartridge housing

C_o	No cartridge housing
NBG_1C_1	Configuration NBT_1C_1 with grit on the last inch of cartrdige housing

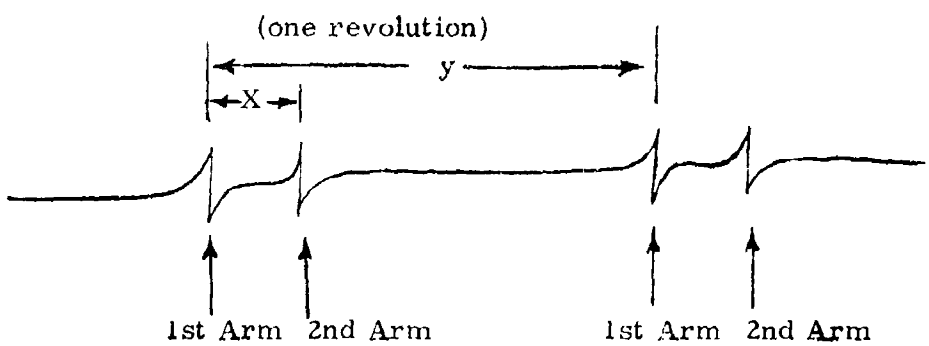
The M329A1E1 is designated by NBT_1C_1. The configuration shown in Figure 4 is NBT_1C_o.

Performance Flight Tests

Performance flight tests have been conducted, the majority of them at Yuma Proving Ground. Firings in January 1969 involved two preliminary designs with different boattail lengths, which will be called the "long" boattail (0.85 calibers) and the "short" boattail (0.65 calibers). The objective of subsequent firings was the development of an effective rotating band and obturator. Camera coverage was requested for some of these rounds to obtain a yaw record over and past the peak. All rounds were fired from the M30, 4.2 inch Mortar tube, which has a progressive twist resulting in one turn of the projectile in 20 calibers of linear travel.

Yaw Sonde Program

Yaw sondes and their use are fully described in Reference 2. Briefly, a yaw sonde fuze consists of two strips of photovoltaic material arranged to intercept a ray of light which is passed through a pin hole in the side of the fuze body. The strips are placed on a plane containing the axis of symmetry of the projectile in the form of an inverted V. As the projectile rotates in flight a sun ray impinges on each arm of the V. The resulting signals which take the form;



are transmitted to a recording station. As the projectile yaws while rotating, the sun ray moves up or down the axis of the projectile. Thus the ray takes a shorter or longer time to cross from the first to the second arm of the V. Therefore, as the yaw angle and the spin rate decay various values of x and y are obtained. Having previously calibrated the yaw sonde with a fixed light source and special angle measuring devices, a graph of sun angle vs a function of x and y can be determined. This calibration is then applied to the signals obtained from free flight and a plot of sun angle vs time of flight is obtained.

The yaw sonde firings of the M329A1E1 projectile were a joint effort of the BRL at Aberdeen Proving Ground and Picatinny Arsenal. Wallops Island was chosen as the site of the test, primarily because of the quality of instrumentation available there. Tracking instrumentation included a MPS-19 radar.

Six yaw sonde-equipped M329A1E1 rounds were fired on 22 and 23 October 1969 under the conditions listed in Table 1. Since the yaw sonde package is lighter than the standard fuze, the physical characteristics of the projectile differ from the standard M329A1E1 projectile. They are also listed in Table 1. Figure 5 shows a yaw sonde-equipped M329A1E1 projectile.

EXPERIMENTAL PROCEDURE

BRL Transonic Range

For small yaw angles the BRL Transonic Range test was conventional. However, to reproduce the rather large yaw levels (due to yaw of repose) which have been measured for low velocity and high quadrant elevation fire, a four-kilogram Lexan cylinder was placed 75 centimeters from the muzzle. By glancing the projectile off this cylinder, yaws in excess of 30° were produced without damage to the shell.

NASA Ames 12' Pressure Wind Tunnel

The preparations and techniques used for obtaining Magnus data in wind tunnels are outlined in Reference 3. The Reynolds number-Mach number combinations at which data was recorded in the Ames 12' Pressure Wind Tunnel are plotted in Figure 3. Where possible, the stagnation pressure was atmospheric. Reynolds numbers above and

below this value also were considered. When tunnel conditions were proper and the Mach number correct, the angle of attack was set and the model spun-up to approximately 12,000 rpm. As it was allowed to spin down, readings from all gauges were taken as a function of spin rate on Mosley X - Y Recorders. For the pitch recorders zero moment was positioned in a convenient place on the chart while static tunnel conditions existed. The tunnel then was put into operation and the model rotated through the angle of attack range. For the yaw recorders zero moment was extrapolated back to the point of zero spin rate. Figures 6 and 7 are typical raw data charts. After all Mach number and Reynolds number combinations had been run, a special mounting drive system was used to obtain data to 30° for a Mach number of 0.3 and the Reynolds numbers involved. Considerable overlap was allowed in order to maintain the continuity of the reduced data. A sand band of No. 20 grit was attached to the last inch of the boom for two Mach number - Reynolds number combinations to aid in the investigation of subcaliber after body effects. Mach numbers of 0.3 and 0.55 and their respective Reynolds numbers of 1.7×10^6 and 2.9×10^6 were involved.

Performance Flight Tests

Flight tests at Yuma Proving Ground were established to examine the performance at high and low charges as well as high and low quadrant elevations. Muzzle velocity was determined by use of velocity coils and magnetized shell. Range and deflection were measured by spotting personnel. In addition, for some rounds, cameras were positioned at the muzzle for spin and yaw measurements and under the trajectory peak of a low charge, high quadrant elevation flight for a determination of the yaw of repose (Fig 8).

Yaw Sonde Program

In setting up the yaw sonde test, the tube was positioned 1,300 ft from the radar along an azimuth of 143°. Line of fire of the low charge rounds was along an azimuth of 115°, while high charge rounds were along 130°. The muzzle velocity of each round was measured by a Fastax camera. Trajectory data, including range, altitude, and deflection, were obtained from an MPS-19 tracking radar for each projectile.

DATA REDUCTION TECHNIQUES

BRL Transonic Range

The methods used in the analysis of the transonic range data are documented in References 4 and 5. The angular orientation as well as the position of the projectile in the range are fitted to a closed form solution of the linearized equations of motion by differential correction and least square fits. If a nonlinear system is indicated, the total results must be reviewed on a quasi-linear basis to determine the aerodynamic coefficients.

NASA Ames 12' Pressure Wind Tunnel

Reduction of wind tunnel data is fairly straightforward; however, a determination had to be made concerning the extent of sting interference on the contribution of the boom to Magnus forces and moments. The circulatory flow about the boom itself was felt to be a stronger Magnus generator than boom-end effects; and since the sting was not expected to have greatly disturbed this flow (Refs 6, 7, and8) data could be considered meaningful. Wind tunnel data reduction was performed by two independent units, the Data Reduction Section at Aberdeen Proving Ground, and a reduction unit at Picatinny Arsenal. At Picatinny Arsenal a computer program was developed to reduce readings from the Mosley recorders, shift the resulting force and moment coefficients to pass through zero at zero angle of attack, and plot the shifted coefficients. A 5^{th} - 11^{th} order fit (depending on the data) is represented by the solid line on each plot. Secant slopes of the Magnus and pitching moment coefficients vs angle of attack have been plotted for the reduced data points as well as the higher order fits. All moments and centers of pressure are referenced to the center of gravity (2.48 calibers from the nose) and Magnus force and moment coefficients were calculated using the nondimensional spin parameter pd/2V.

Performance Flight Tests

For the most part performance flight tests yielded only statistical data. Plots of range and deflection vs muzzle velocity help to indicate short rounds, and computation of standard deviations of range, velocity, and deflection are a means of comparing performance of the M329A1E1 with the M329A1. Spin rate calculations were made from

camera coverage at the muzzle for specially painted shell. Yaw histories were measured directly from the muzzle and the downrange camera records, and are discussed in the Section "Experimental Procedures/Performance Flight Tests".

Yaw Sonde Program

Raw data from the yaw sondes was transformed into sun angle and time of flight data and placed on magnetic tape by BRL. These values were then plotted (sun angle vs time of flight) with the aid of the high speed computer. The method of Chapman and Kirk (Ref 9) and a specially modified six degree of freedom trajectory program were used in an effort to reduce the angular motion output of the yaw sonde to aerodynamic coefficient form. Briefly, the size of the section of data to be fitted by the method of Chapman and Kirk was limited by the change in Mach number, since it is not yet one of the fitted parameters. This allowed Mach number variation was established by plotting wind tunnel and range data vs Mach number and then limiting the

$$\frac{\Delta C_{m_\alpha}}{\Delta \text{Mach No.}}, \quad \frac{\Delta C_{m_q}}{\Delta \text{Mach No.}}, \quad \frac{\Delta C_{n_{p_\alpha}}}{\Delta \text{Mach No.}}$$

to $\pm 2\%$ of the value at the average Mach number of the section. Certain differential equations of angular motion were then fitted to these sections of data. Both linear and nonlinear C_{m_α}, C_{m_q}, and $C_{n_{p_\alpha}}$ were considered.

PRESENTATION OF TEST RESULTS

BRL Transonic Range

Data from the BRL transonic range is presented in Table 2. Coefficient values within selected Mach number ranges have been plotted vs angle of attack (Figs 9, 10 and 11).

NASA Ames 12' Pressure Wind Tunnel

The results from the Ames 12' Pressure Wind Tunnel have been plotted vs angle of attack. As was previously mentioned, the solid line through the data points represents a 5th - 11th order fit.

Figures 12 through 157 are plots of normal force coefficient, pitching moment coefficient, and normal force center of pressure vs angle of attack. Several nondimensional spin rates and Reynolds numbers are included for each Mach number.

Early in the test it was noted that the output on the forward pitch recorder was of poor quality. The difficulty was traced to a crushed lead wire to the forward pitch recorder. Normal force data on configuration NBT1C1 taken at Mach numbers of 0.3 and 0.55 at various Reynolds numbers was affected by the faulty lead wire, could not be rerun, and is not reported here.

Magnus force coefficient, Magnus moment coefficient and Magnus force center of pressure are plotted in Figures 158 through 333.

From this data, secant slopes of pitching moment and Magnus moment vs angle of attack have been calculated and are presented in Figures 334 through 357. The symbols on slope plots represent Cm_α's and Cn_{p_α}'s for each data point. The solid line is the calculated Cm_α or Cn_{p_α} vs angle of attack from the fit to the original data. Figures 358 through 367 show the relationship of Cm_α and Cn_{p_α} to Mach number, $\frac{pd}{2V}$, and Reynolds number. Agreement between the two independent reductions of this data is excellent. An average deviation of ±2% was found in the check cases.

Performance Flight Tests

Results from performance flight tests include some plots displaying range vs velocity performance (Figs 368 and 369).

In addition, some of the film records were translated into pitch and yaw data at various points throughout the trajectory (Figs 370 through 374). At the time of these firings, the rubber obturator had failed to separate from the projectile at low charges. Figure 375 is a photograph of the M329A1E1 soon after exiting the muzzle at a velocity of 255 feet per second. The obturator is clearly on, although displaced from its original setting, undoubtedly causing adverse aerodynamic loads. This displacement is caused by the force of the muzzle gases as they pass over the projectile shortly after it exists the muzzle.

At high charges, the obturator is broken by the blast; but at some intermediate charges it is possible that it will be forced to a position anywhere along the projectile.

DISCUSSION AND ANALYSIS
(BRL Range and Ames Wind Tunnel)

The following discussion and analysis directly compares results from the BRL Range and the Ames Wind Tunnel. Yaw Sonde results will be discussed separately, due to the unique methods by which they are obtained and the care with which they must be interpreted.

Pitching Moment Coefficient Derivative (C_{m_α})

Referring to Figure 376, the range, wind tunnel and SPINNER (Ref 10) agree well for this parameter. The increase in the transonic region is partially due to an increase in the normal force coefficient and largely due to a forward (meaning towards the nose) movement of the normal force center of pressure with increasing Mach number (Fig 376). A plot comparing C_{m_α} for the three configurations tested in the Ames Wind Tunnel appears as Figure 358. The Reynolds number effects are small (less than 3%). C_{m_α} is about 44% lower for the square base configuration NBT_2C_1. Although the normal force of NBT_2C_1 is greater, the center of pressure is considerably closer to the center of gravity than NBT_1C_1. At the lower Mach numbers the pitching moment coefficient derivative of NBT_1C_1 is greatest because its normal force center of pressure is slightly more forward of the center of gravity than for NBT_1C_0. The normal forces are the same. At the high Mach number (0.85 - 0.95) NBT_1C_1 has an 8% lower normal force than NBT_1C_0. Its center of pressure remains more forward of its center of gravity. Thus NBT_1C_1 and NBT_1C_0 have nearly the same C_{m_α}'s at $M = 0.85$ and 0.95. The effect of angle of attack on C_{m_α} is most clearly demonstrated at $M = 0.305$ (Figs 340 and 342). This decrease in C_{m_α} is due to a rearward movement of the normal force center of pressure with an increase in angle of attack. For the other Mach numbers, the angle of attack ranges are not nearly so large, and C_{m_α} tends to remain nearly constant. A linear approximation up to 10° appears to be an accurate one here.

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Magnus Moment Coefficient Derivative ($C_{n_{p_\alpha}}$)

Figures 193, 204, and 218 show reasonably good agreement of the BRL Range and the Ames Wind Tunnel data for this difficult-to-measure parameter. Of particular interest is the fact that the range as well as the wind tunnel data shows a negative $C_{n_{p_\alpha}}$ at Mach number 0.567 and 9° angle of attack. The effect of this on stability will be discussed in a later section.

The point should here be made that small force and moment Magnus data, normally at the lower angles of attack, may contain considerable percentage error; however, relative magnitudes and consistent trends are of value. $C_{n_{p_\alpha}}$ versus Mach number for the three configurations tested in the Ames Wind Tunnel are shown in Figures 359 and 360. As Mach number increases in the transonic region $C_{n_{p_\alpha}}$ for Configuration NBT_1C_1 peaks sharply due to a sharp rise in Magnus force. NBT_2C_1, however, behaves quite differently, remaining nearly constant throughout the same region. It is not uncommon for square base projectiles to peak at higher Mach numbers than boattail projectiles. The boomless Configuration NBT_1C_0 has a lower $C_{n_{p_\alpha}}$ throughout most of the Mach number range tested, supporting the belief that the boom is a Magnus generator even at low angles of attack. Figures 361 and 367 show the variation of $C_{n_{p_\alpha}}$ with both pd/2V and angle of attack. At the lower angles of attack and pd/2V's, $C_{n_{p_\alpha}}$ tends to be negative. This is primarily due to a positive Magnus force in this region of somewhat uncertain data. The trend, however, is consistent throughout the entire Mach number range.

Drag Coefficient (C_D)

The drag coefficient, for small yaws, as measured in the BRL Range, agrees well with the SPINNER data bank (Fig 317). Six-degree of freedom trajectory simulations using such drag data closely agree with full range firings at Yuma Proving Ground.

Pitch Damping Coefficient ($C_{m_q} + C_{m_{\dot{\alpha}}}$)

($C_{m_q} + C_{m_{\dot{\alpha}}}$) as determined by the BRL Range appears constant above 4° for Mach numbers below 0.543. Between M = 0.638 and 0.867, $C_{m_q} + C_{m_{\dot{\alpha}}}$ is constant above 2° (Figs 11 and 380). Below these angles of attack, $C_{m_q} + C_{m_{\dot{\alpha}}}$ becomes less negative, indeed, has been measured as positive at some low angles of attack. This could be caused by a dominance of the $C_{m_{\dot{\alpha}}}$ term.

Gyroscopic Stability

Referring to Figure 381, the gyroscopic stability factor of the M329A1E1 remains within acceptable bounds throughout the Mach number range. The improvement over the M329A1 Projectile also is clear. Simulating -26.3°F lowers the gyroscopic term over 16% but it still remains well within the region of gyroscopic stability.

Dynamic Stability

Nonlinear damping factors, $\lambda^*_{1,2}$ from the quasi-linear theory, were calculated using data from the Ames Wind Tunnel, and plotted vs angle of attack in Figures 382 through 386. These parameters give an insight into what can be expected in terms of angular motion as the projectile traverses a trajectory. One may qualitatively explain the motion of a low charge high quadrant elevation round with the aid of Figure 382 in the following way: As the projectile exits the muzzle, it receives an initial disturbance resulting in an average maximum yaw of 1 or 2 degrees. At this point the precessional mode appears to be slightly undamped. Of course, due to the error in the data and the sensitivity of $\lambda^*_{1,2}$ to Magnus and damping, the precessional mode may be slightly damped. On the way to the trajectory peak a rather large yaw of repose appears and carries the projectile into a region where the precessional mode is heavily damped while the nutational mode is strongly undamped. From here on it becomes a race up to the ground impact, as the K_1 arm grows and the K_2 arm damps. The damping factors are functions of Mach number and angle of attack (Figs 382 through 386). As the Mach number decreases, there are changes in the size of the small angle precessional limit cycle until eventually a nutational limit cycle will appear.

Similarly, if the projectile is disturbed upon launch from the muzzle to an angle of attack of 12°, below M = .75, the angular motion will diverge due to a nutational instability. The result of this is, of course, a short range.

DISCUSSION AND ANALYSIS
(Yaw Sondes)

Many attempts have been made to fit the differential equation of motion to the angular motion data obtained from the yaw sonde. While performing these fits, in addition to holding the coefficients C_{m_α}, $(C_{m_q} + C_{m_{\dot\alpha}})$, and $C_{n_{p_\alpha}}$ constant, various combinations of higher order terms were considered. Convergence of the equation of motion to the data was achieved for many of these combinations resulting in some reasonable fits. Some of the coefficients which generated such motion are, however, not in good agreement with those of the wind tunnel and transonic range. Among the questions raised due to these disappointing results are:

1. What accuracies are needed in yaw sonde manufacture and calibration ?

2. How sensitive is the motion and thus the fit, to rather large nonlinearities in the coefficients ?

3. For a given set of yaw sonde sun angle data, radar data, and projectile physical parameters, how accurately can we separate and determine the Magnus and damping moments ?

While we are not ruling out fitting the equation of motion to yaw sonde data as a powerful tool in stability coefficient determination, the results of our analysis do not, at this time, merit publication until additional efforts in the area can answer some of these important questions. A qualitative discussion of the results from the yaw sonde follows.

Figures 387 through 392 show solar aspect angle data from the yaw sonde for a projectile fired at a 45° quadrant elevation and two projectiles fired at a 60° quadrant elevation. All three projectiles had a muzzle velocity of approximately 1050 feet per second.

Referring to the damping factor plots (Figs 382 through 386) one can see that the precession arm will undamp up to two degrees at a Mach number of 0.95 and up to almost five degrees for a Mach number of 0.85. We can expect, therefore, that the precessional arm should be slightly undamped near the muzzle. This is the case for the three examples shown. The initial magnitude of the nutational arm may be attributed to the muzzle disturbance. As the Mach number decreases on the up leg of the trajectory the precession damps as shown by the damping factors of Figures 382 through 386, and the nutational arm can be expected to grow to one or two degrees. This behavior will be enhanced by the increase in $Cn_{p\alpha}$ due to the increased pd/2V in this region. The precession damps as the peak of the trajectory is traversed due to the decreasing Mach number. On the down leg of the trajectory, the combined effects of the yaw of repose, the Mach number increase, and the pd/2V decrease, cause the precessional arm to reappear.

CONCLUSIONS AND RECOMMENDATIONS

The M329A1E1 has adequate damping characteristics and therefore adequate stability throughout its Mach number regime. A problem area appears in the low charge and high quadrant elevation firings due to a rather large gyroscopic term and resulting yaw of repose. When fired with a tail wind this problem becomes greater, and fuze functioning may be affected due to impact at large yaws. In addition, the rubber obturating band has been observed to remain with the round at this minimum charge. Such an occurrence will result in a decrease in accuracy and an unpredictable ground impact angle.

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TABLE 1

Physical characteristics and launch conditions of M329A1E1 yaw sonde rounds

Round No.	V Muzzle (fps)	Q E (deg)	I_x (lb - in.^{2})	I_y (lb - in.^{2})	Weight (lb)	Center of Gravity (inches from base)
4729	267	60	-----	-----	----	-----
4731	255	60	-----	-----	----	-----
4737	1052	45	50.89	386.7	21.0	6.432
4738	1058	45	50.84	387.9	21.01	6.437
4739	1064	60	50.84	385.8	20.96	6.427
4740	1052	60	50.93	386.2	21.0	6.43
Standard M329A1E1			53.0	446.0	22.2	6.8

TABLE 2

Ballistic Research Laboratories' range coefficients

MACH NO.	$\bar{\alpha}$	C_D	C_{m_α}	C_{N_α}	C_{P_N}	$C_{n_{p\alpha}}$	$C_{y_{p\alpha}}$	$C_{m_q} + C_{m_{\dot{\alpha}}}$	S_g	$_1 (10^3)$	$_2 (10^3)$
.523	15.53	.2712	2.5441	1.6720	3.3172	.3008	-.6433	-2.5852	3.13	.0261	- 2289
.543	8.96	.1741	2.9755	1.4035	3.7357	-.1803	.0566	-2.8199	2.64	-.2317	.0328
.517	2.31	.1118	3.0460	0.9987	4.6655	.3710	-.5232	-3.8057	2.54	.0017	-.2253
.527	3.27	.1182	3.0787	1.3353	3.9212	.1282	-.7781	-.9204	2.45	.0344	-.1417
.425	1.38	.1109	2.8179	1.3287	3.7364	-1.0006	-1.0825	10.3487	2.60	.0513	.3838
.435	3.45	.1236	3.0436	1.3305	3.9031	.0404	-.9203	-1.3238	2.45	-.0352	-.0894
.638	4.42	.1277	3.1257	1.3741	3.8904	.1686	-.5005	-3.9880	2.55	-.1120	-.1409
.684	0.69	.1031	3.2785	1.4063	3.9469	-.1034	-.2408	-3.0283	2.32	-.2079	-.0043
.727	3.48	.1185	3.1450	1.2307	4.1712	.2856	.4720	-3.7092	2.40	-.0350	-.1991
.483	14.17	.2160	2.5558	1.5599	3.2541	.2265	-.7287	-1.9454	3.03	.0239	-.1913
.720	3.29	.1195	3.1980	1.6291	3.5786	.2609	.5106	-3.7596	2.43	-.0469	-.2092
.777	1.33	.1075	3.2302	1.5295	3.7275	.1104	-.8910	-2.3079	2.40	-.0493	-.1328
.776	2.31	.1093	3.2737	1.5725	3.5742	.1223	-.7027	-3.2853	2.38	-.0943	-.1408
.797	1.28	.1062	3.2025	.9917	4.8470	.0635	-1.0305	-3.0522	2.38	-.1222	-.0697

TABLE 2 (Cont'd)

MACH NO.	[illegible]	C_D	C_{m_α}	C_{N_α}	C_{P_N}	$C_{n_{p_\alpha}}$	$C_{y_{p_\alpha}}$	$C_{m_q} + C_{m_{\dot\alpha}}$	S_g	$_1(10^3)$	$_2(10^3)$
.815	3.90	.1252	3.3426	1.2097	4.3017	.2047	-.3038	-3.0189	2.32	-.0400	-.1607
.840	2.90	.1193	3.3211	1.9091	3.3552	.2021	.1270	-3.7254	2.22	-.0740	-.1997
.861	4.61	.1381	3.3840	1.8414	3.4534	.1800	.1627	-3.1066	2.26	-.0544	-.1867
.867	4.82	.1411	3.3973	1.6237	3.6934	.1438	-.4448	-3.6415	2.22	-.1067	-.1504

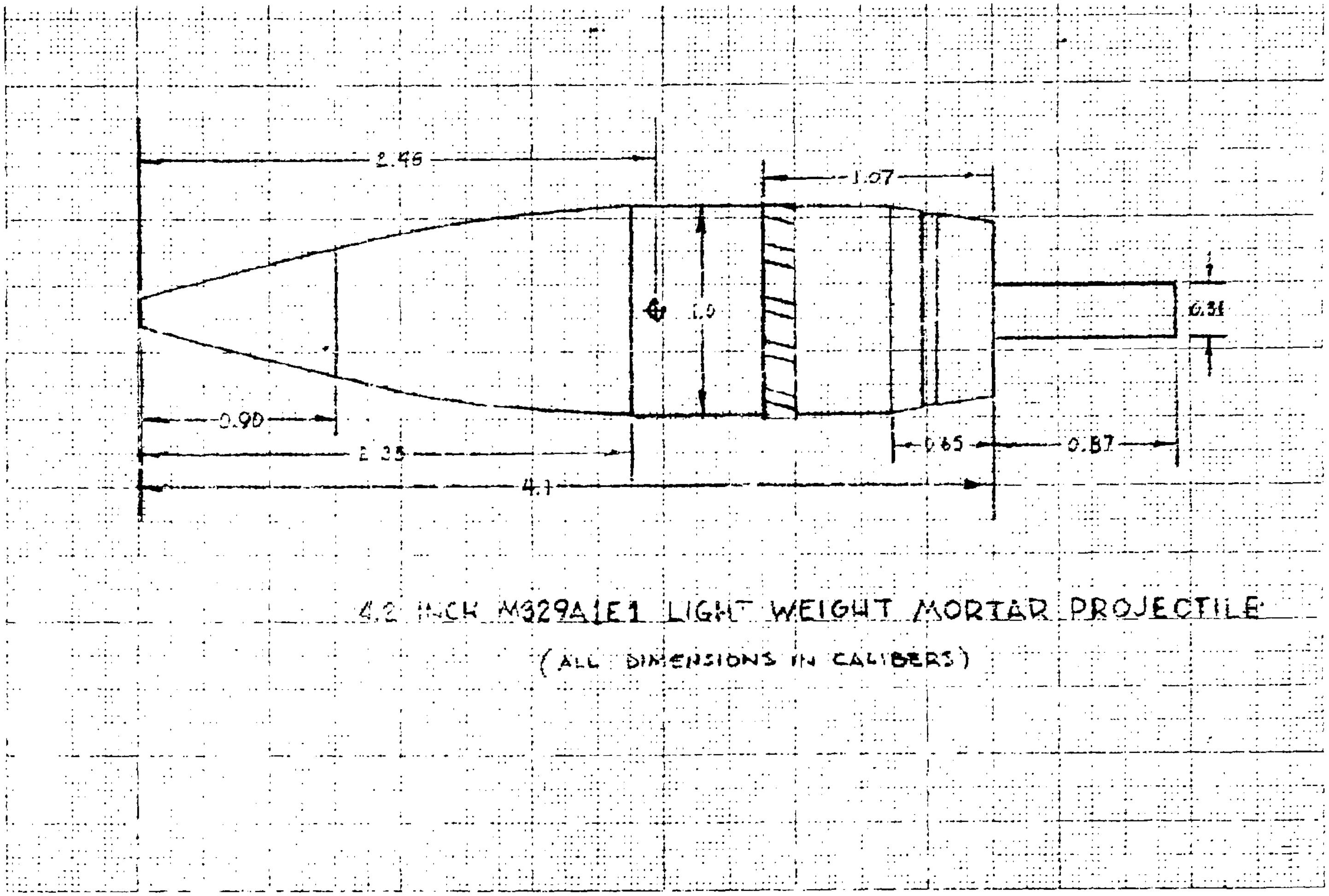
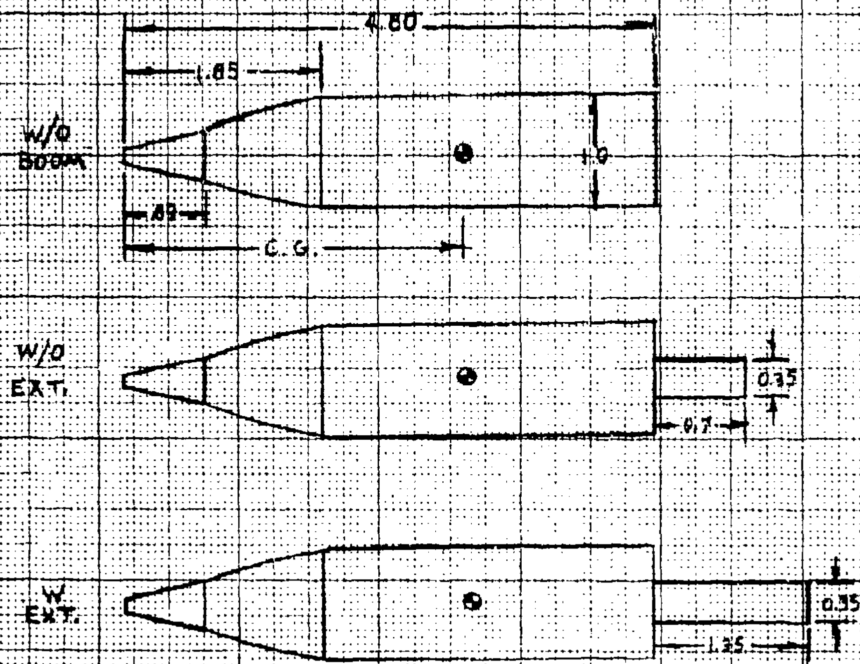


Fig 1 4.2" M329A1E1 mortar projectile
(all dimensions in calibers)

M329A1 4.2 INCH MORTAR PROJECTILE



CONFIG	WGT LBS	AXIAL LB-FT²	TRANSVERSE LB-FT²	C.G. CAL. FRM NOSE	A²/B LB-FT² X 10⁻
W/O BOOM	25.7*	0.4479*	5.208*	2.89*	.385*
W/O EXT	23.9*	0.4479*	5.408*	3.01*	.371*
W. EXT	26.1	0.4479	5.610	3.03*	.350

* ESTIMATED

A – AXIAL MOMENT OF INERTIA

B – TRANSVERSE MOMENT OF INERTIA

(ALL DIMENSIONS IN CALIBERS)

Fig 2 4.2" M329A1 projectile

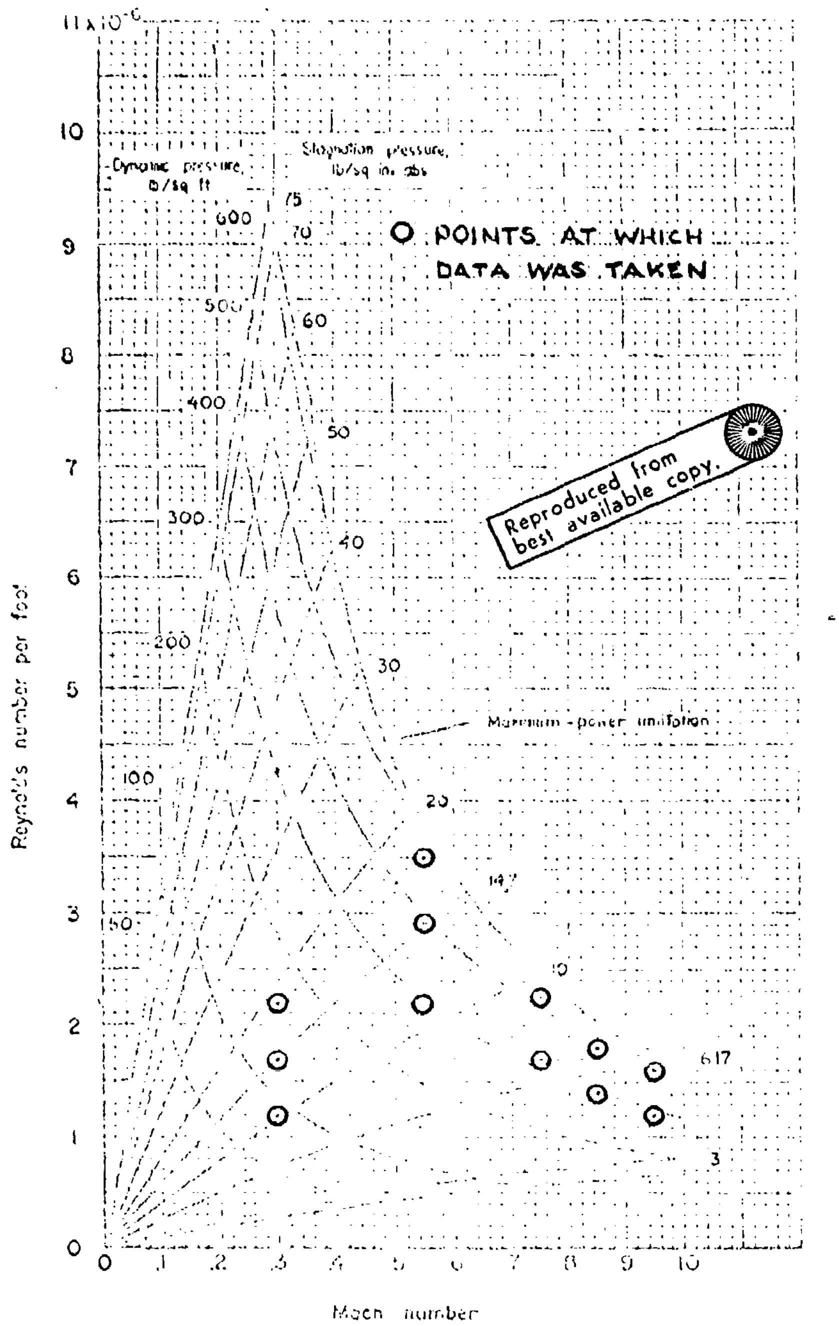


Fig 3 Operating characteristics of the Ames 12' pressure wind tunnel (PWT)

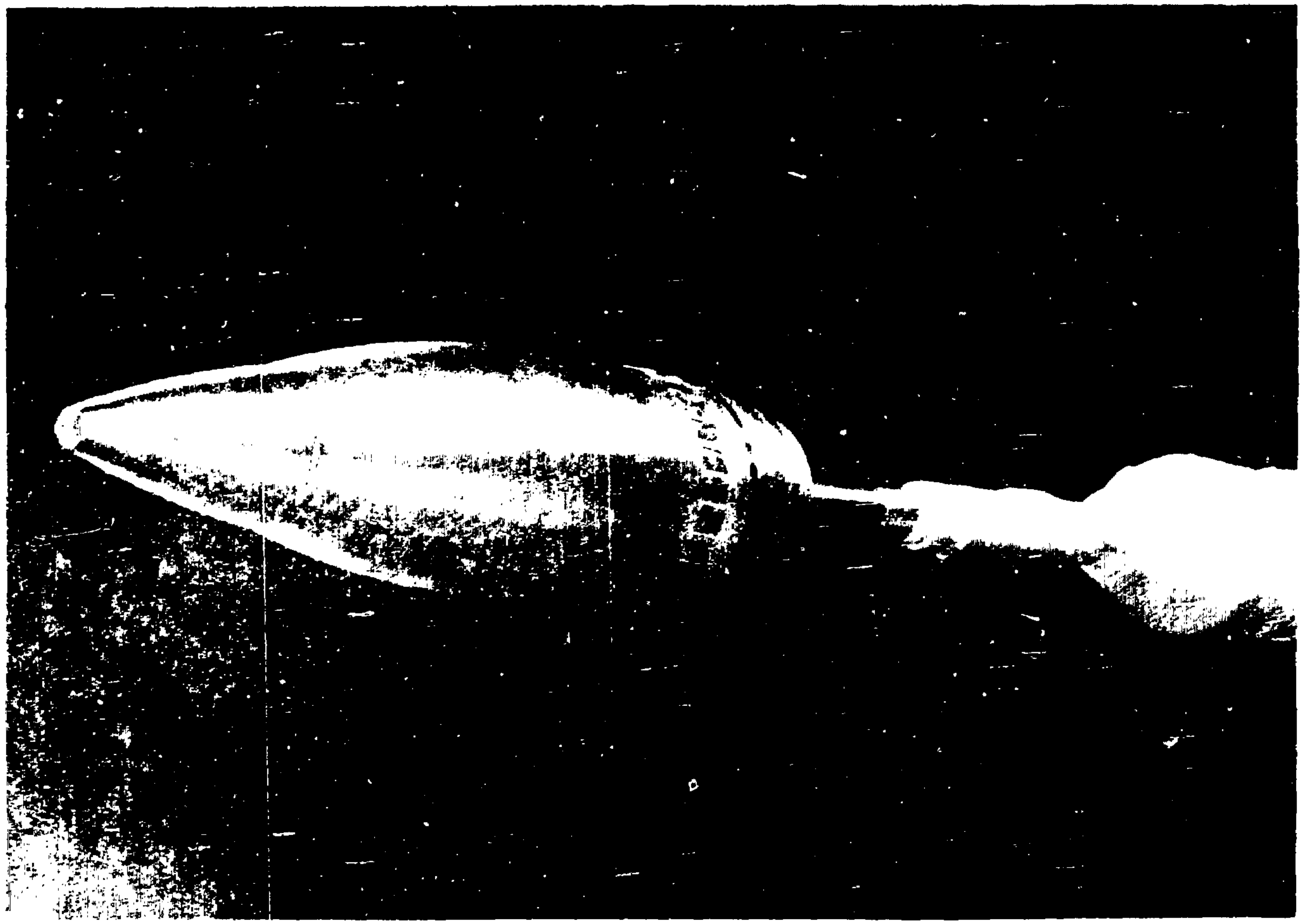


Fig 4 Configuration NBT_1C_o mounted in 12' PWT

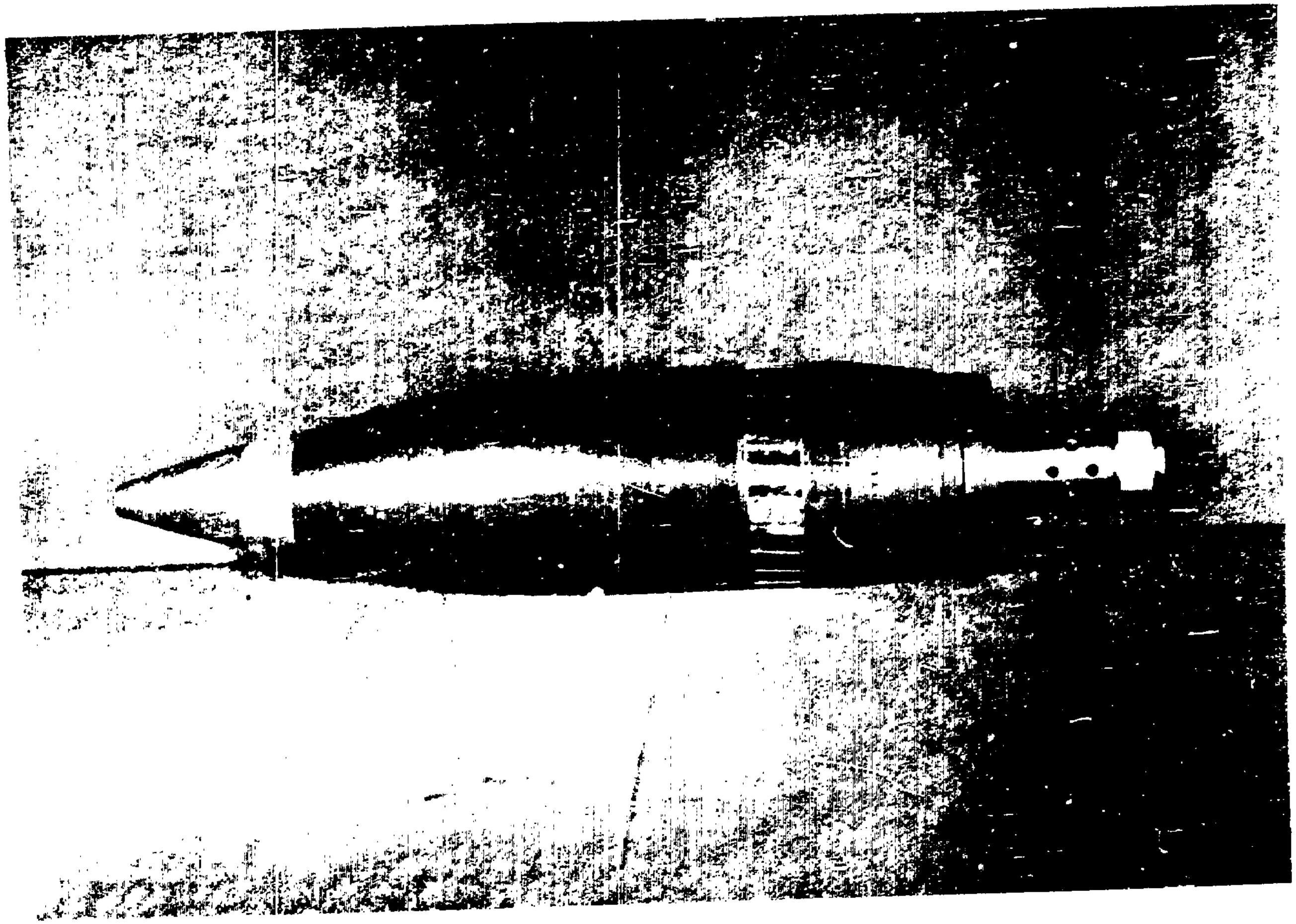


Fig 5   M329A1E1 projectile equipped with yaw sonde

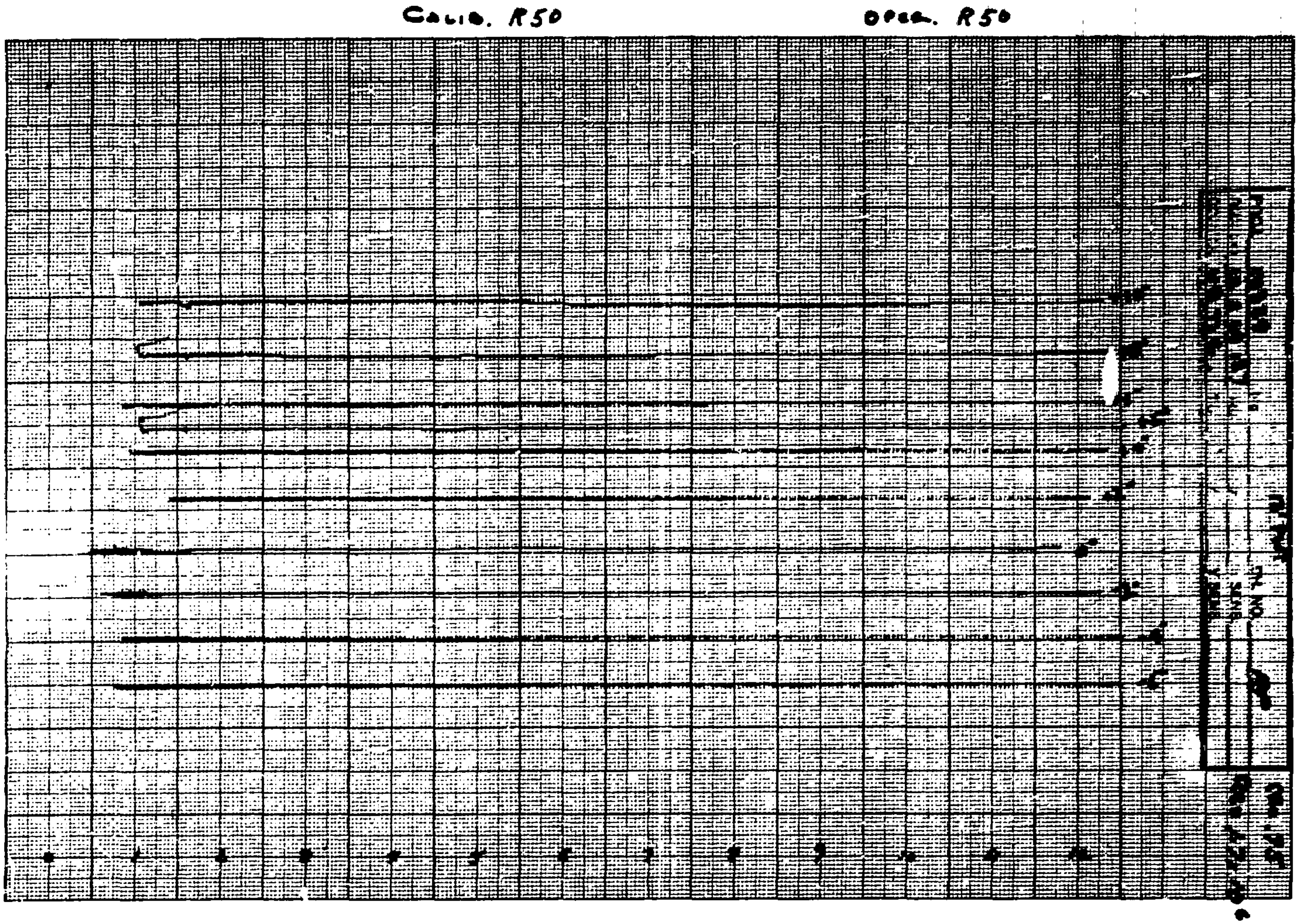


Fig 6 Raw data chart from 12' PWT (pitch gauge readings vs model rpm)

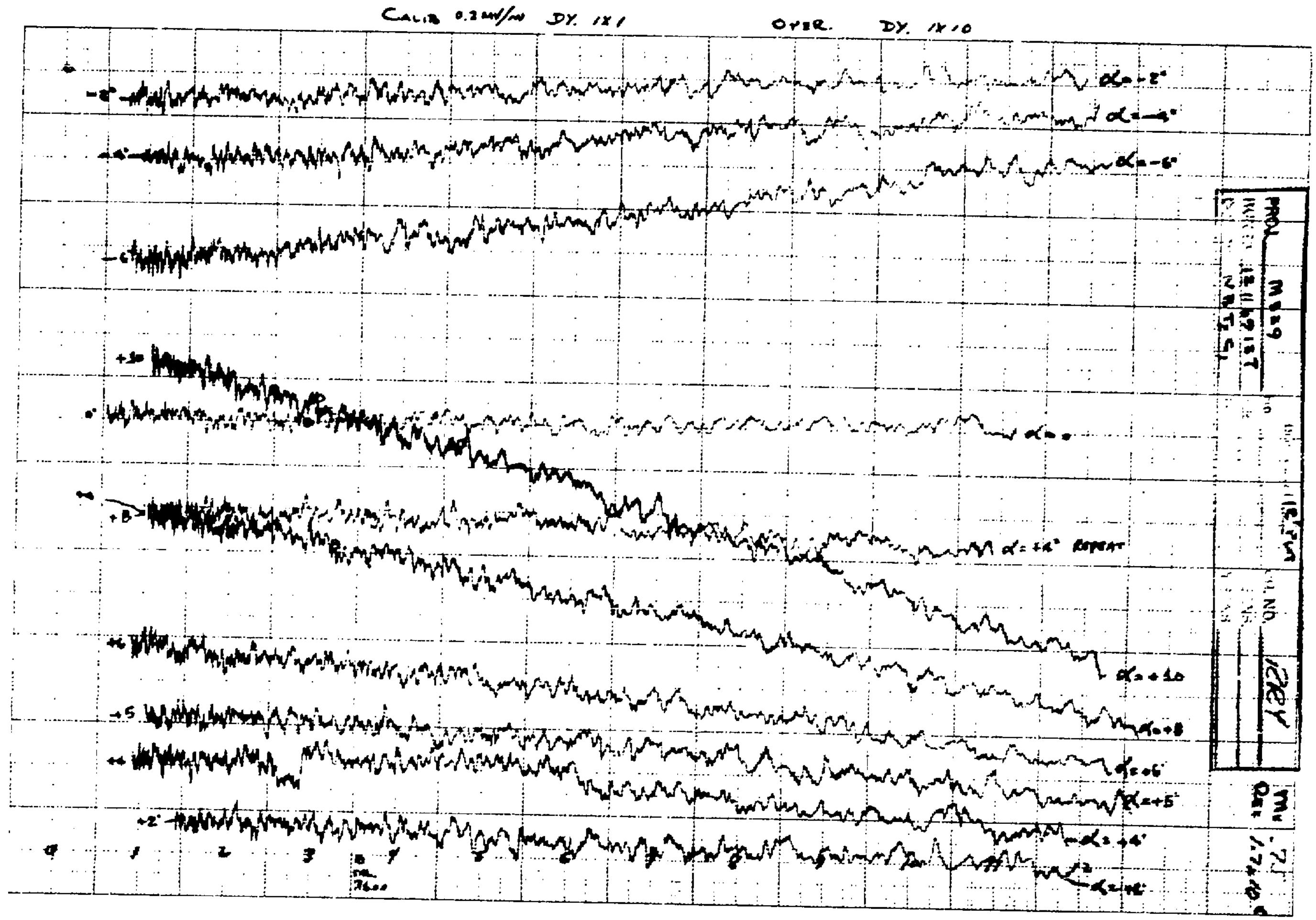


Fig 7 Raw data chart from 12' PWT (yaw gauge readings vs model rpm)

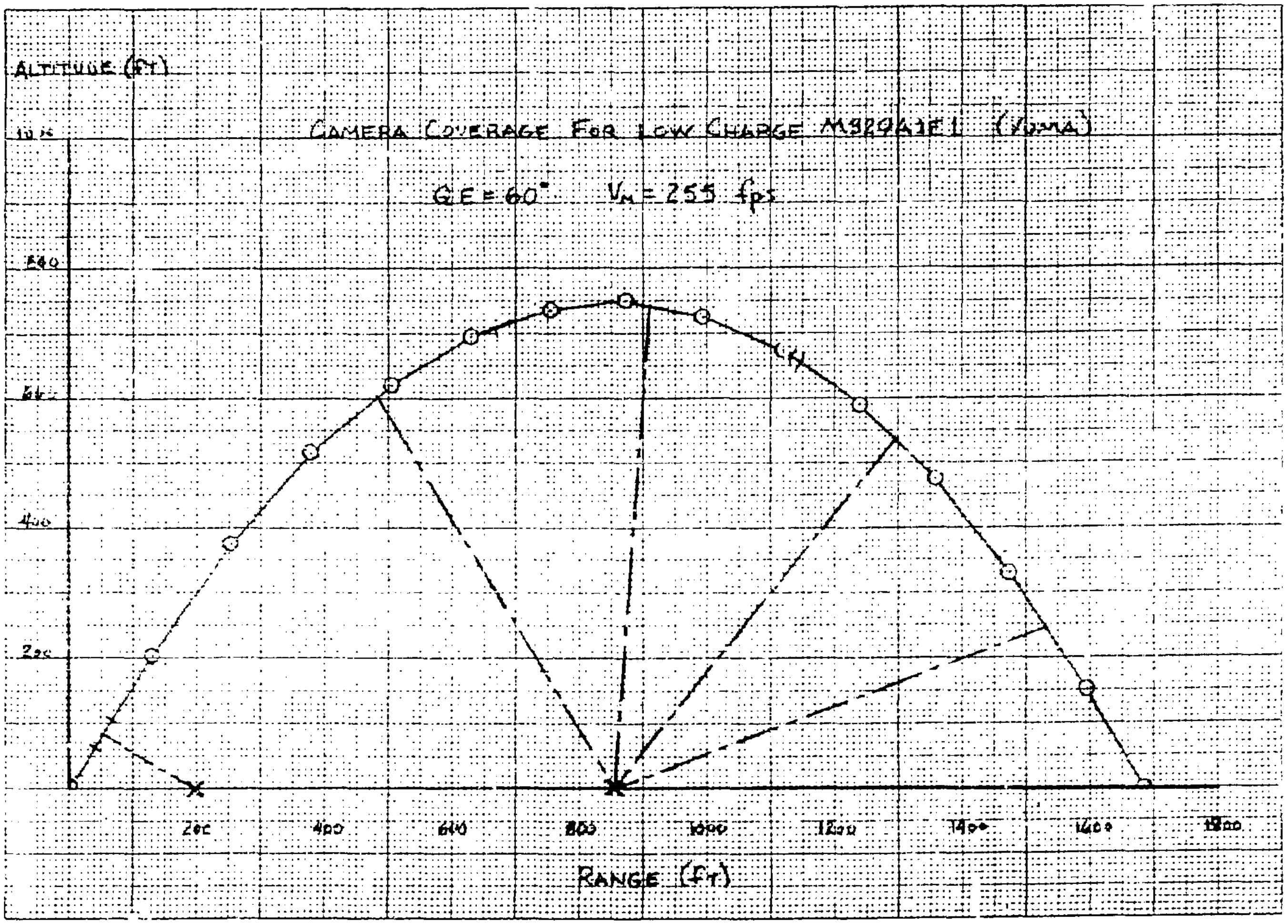


Fig 8   Camera coverage for low charge high quadrant elevation firing of M329A1E1 projectile at Yuma Proving Ground

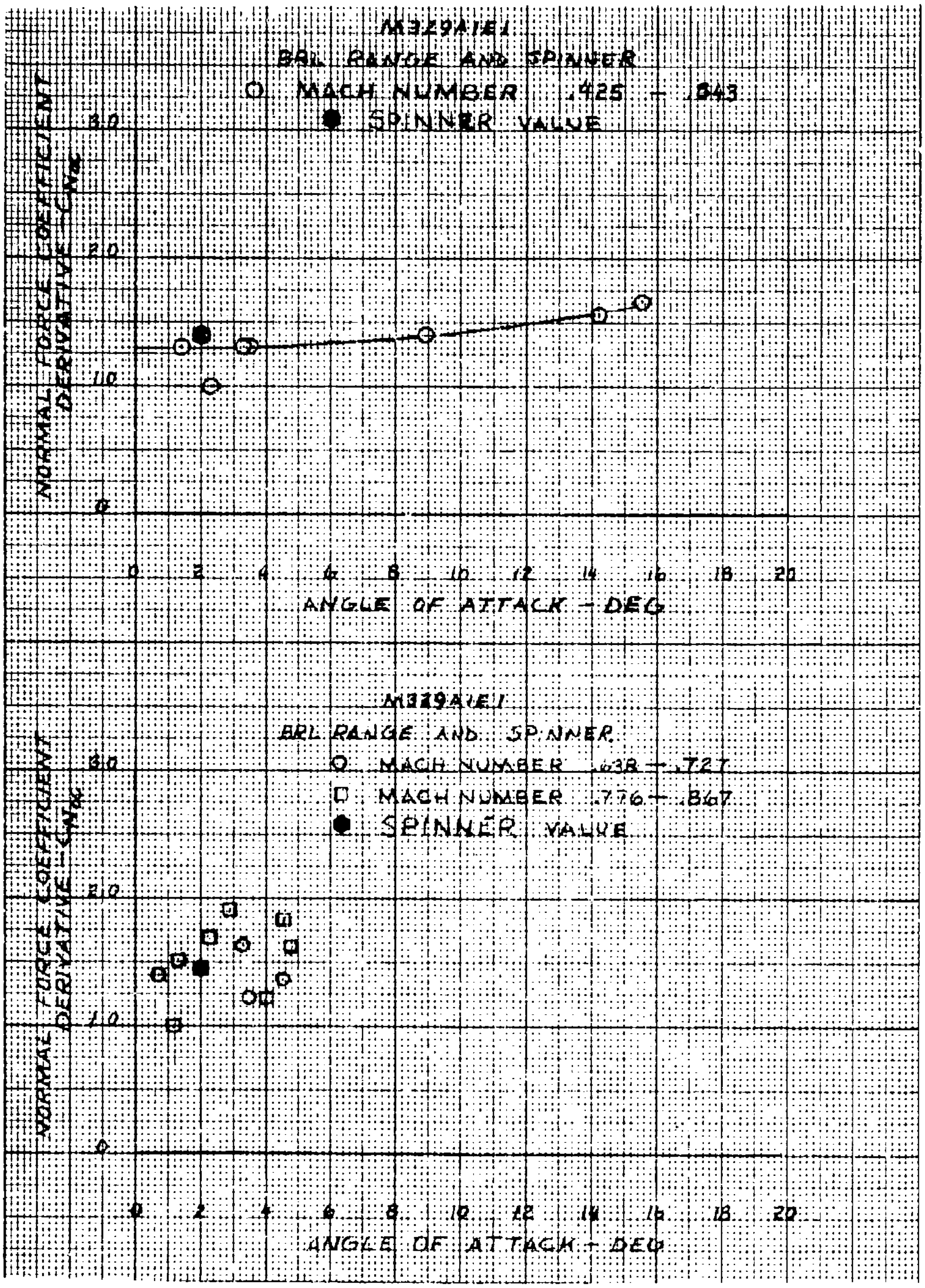


Fig 9 Normal force coefficient derivative vs angle of attack (BRL transonic range)

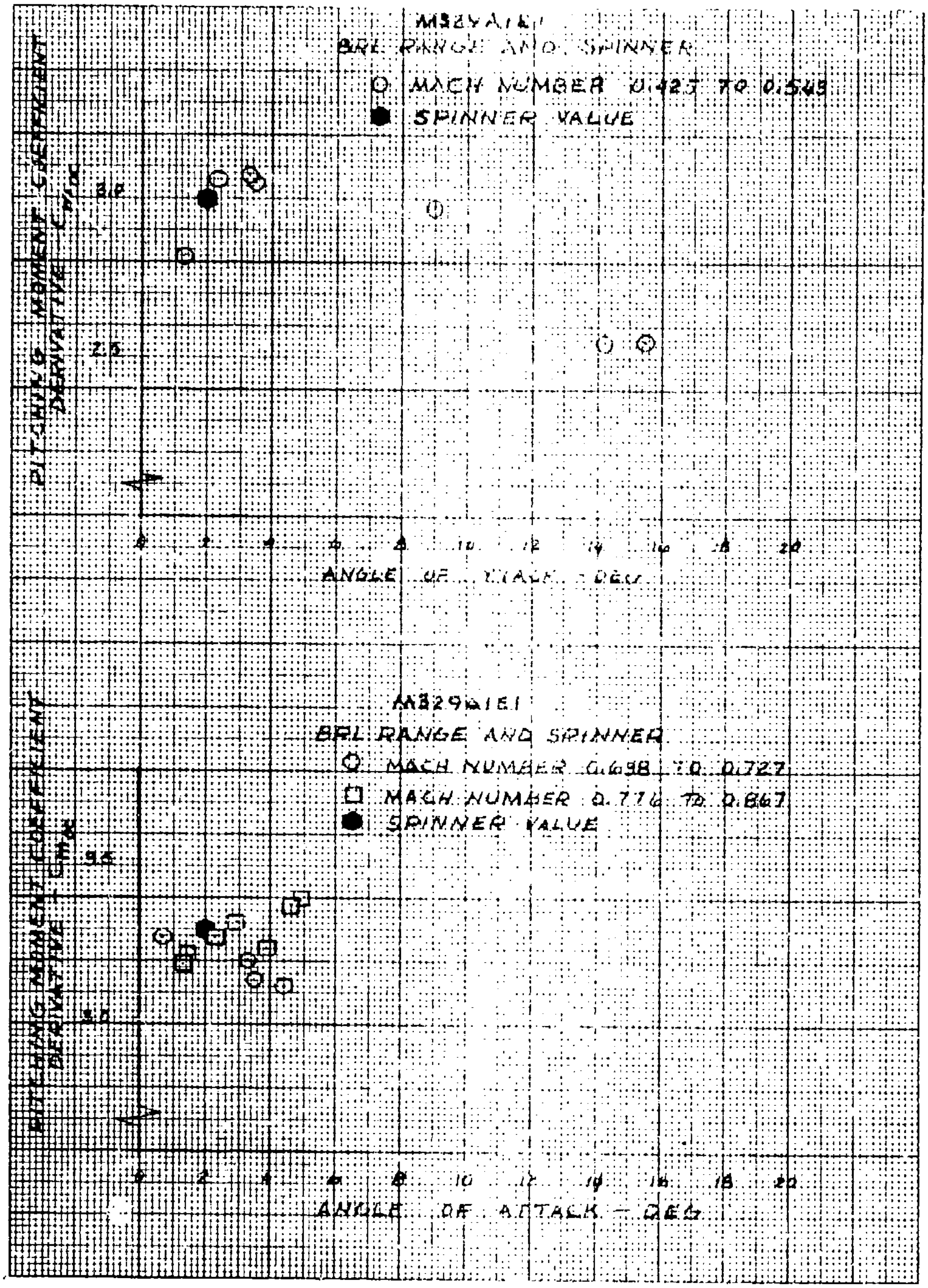


Fig 10 Pitching moment coefficient derivative vs angle of attack (BRL transonic range)

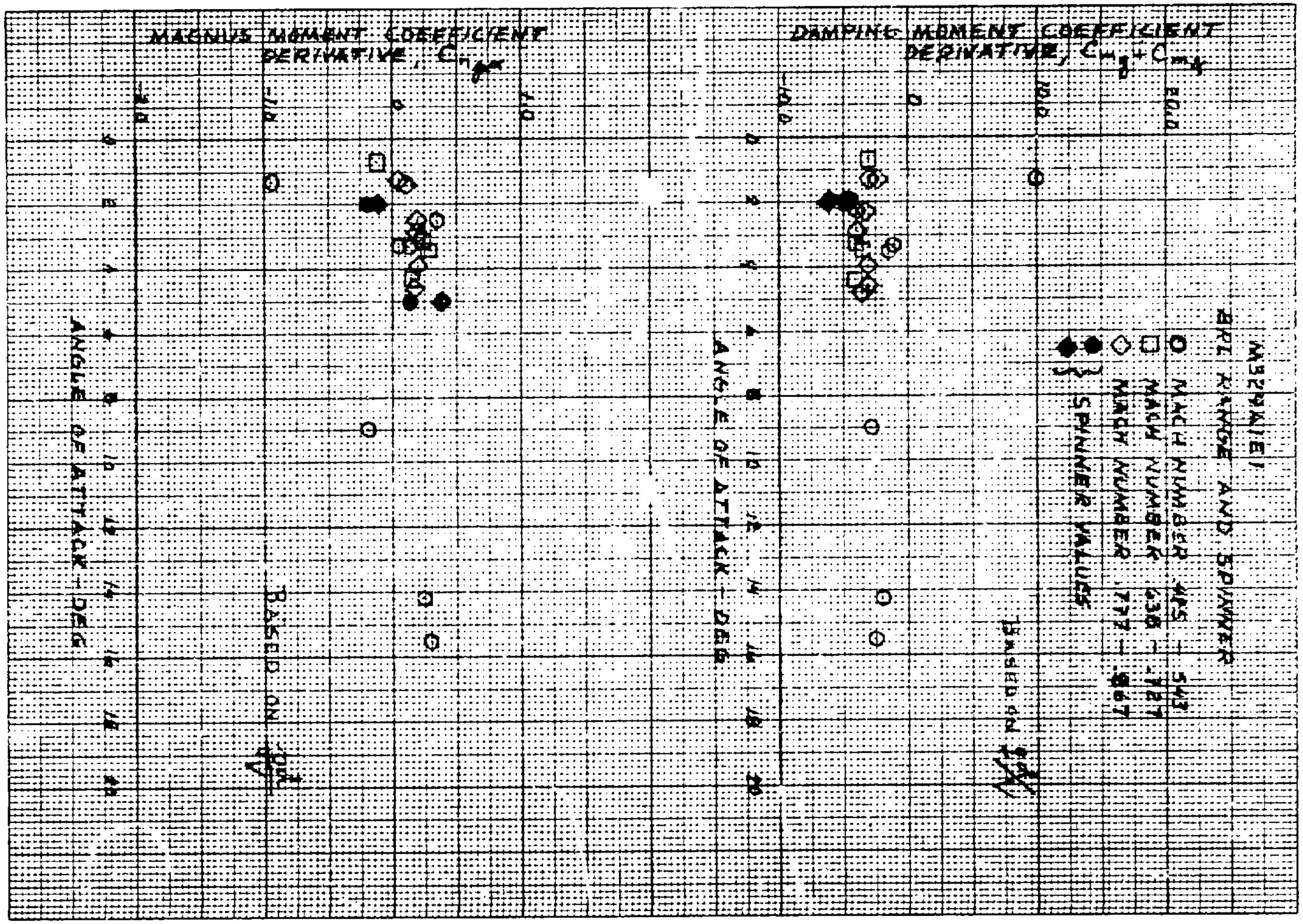


Fig 11 Pitch damping coefficient ($C_{m_q} + C_{m_{\dot{\alpha}}}$) Magnus moment coefficient derivative vs angle of attack (BRL transonic range)

Figures 12 through 157

Normal force coefficient, pitching moment coefficient, and normal force center of pressure vs angle of attack. (Includes several configurations, Mach numbers, pd/2V's and Reynolds numbers [12' PWT] .)

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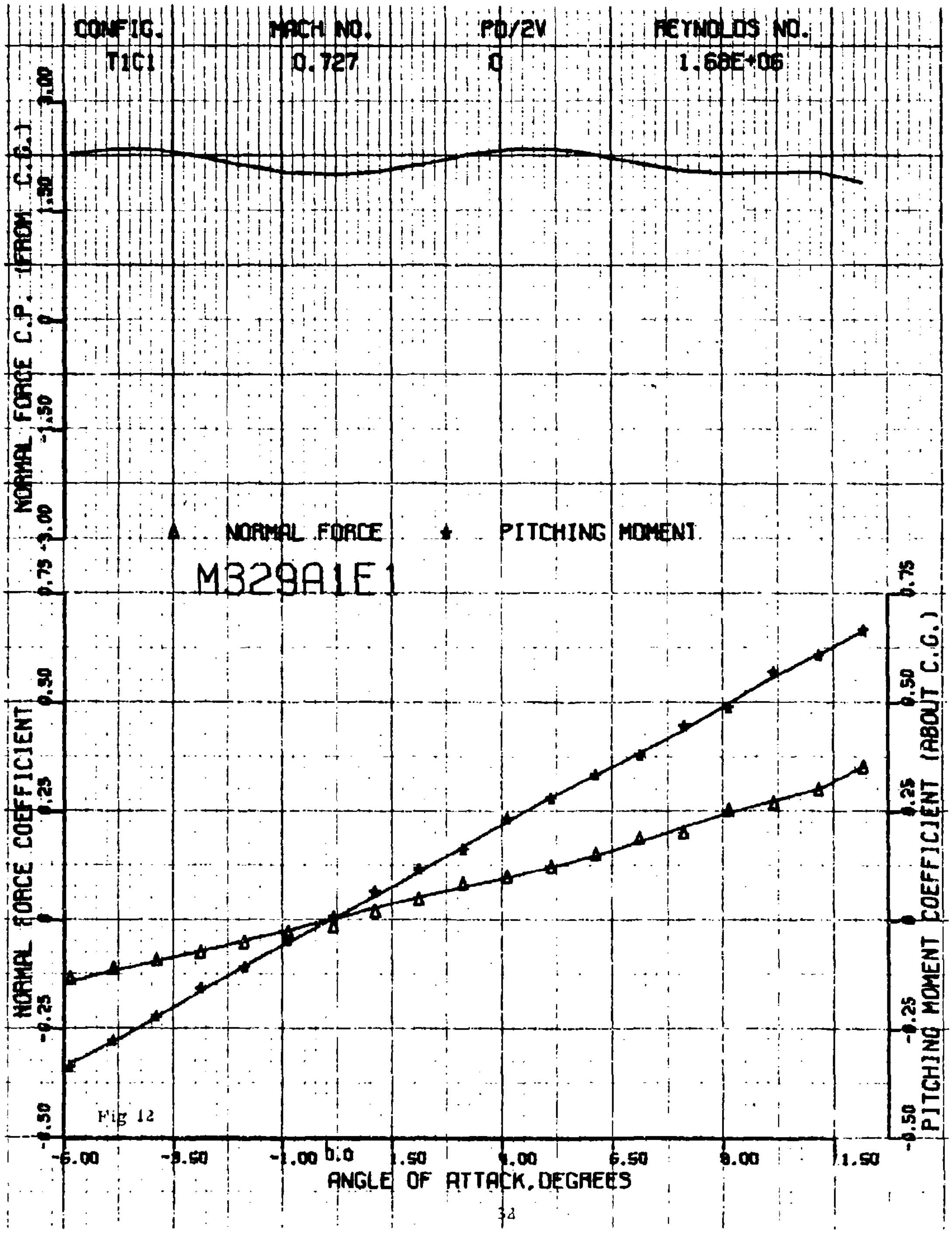

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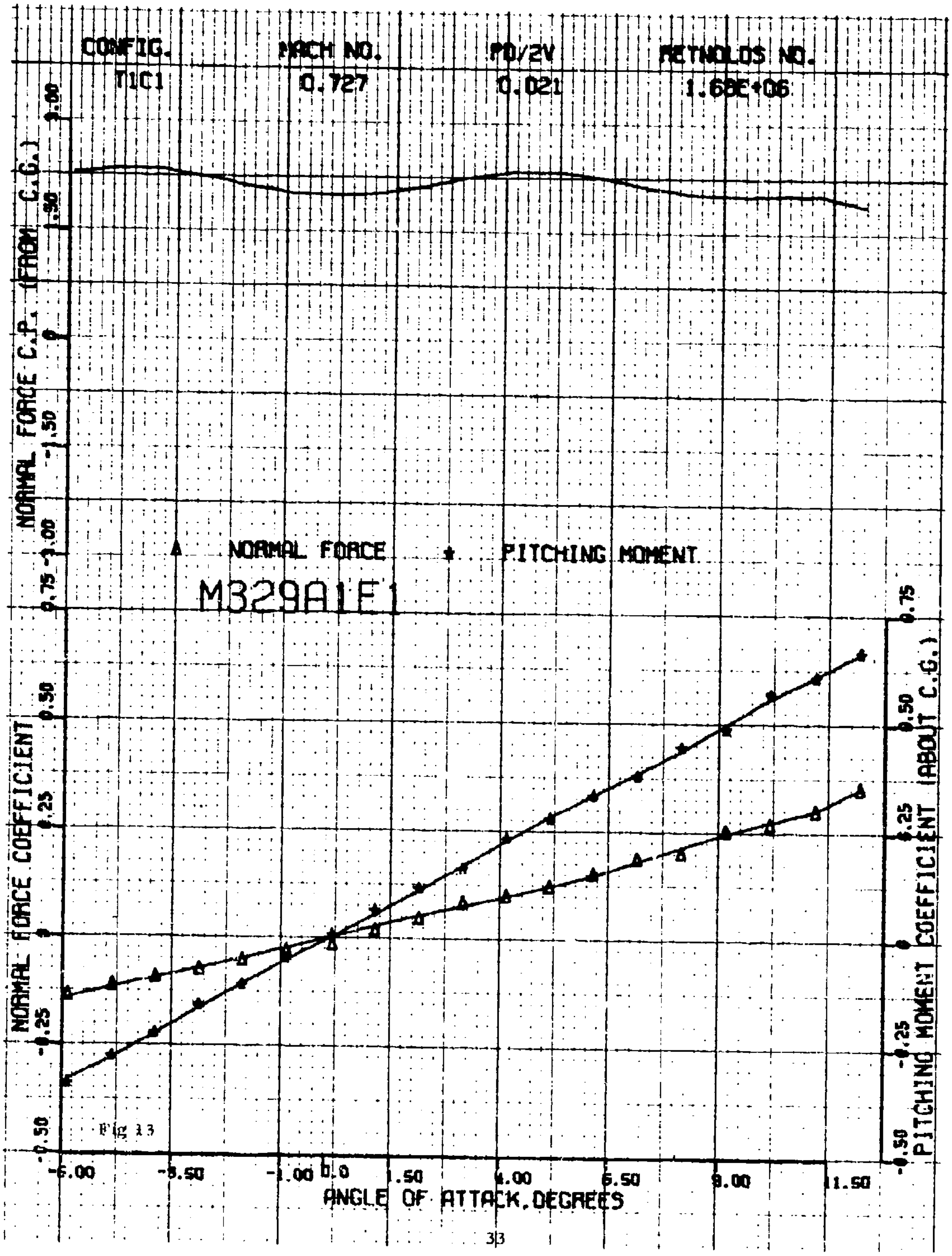
0.727
PD/2V
0
REYNOLDS NO.
1.68E+06
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 12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PD/2V
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REYNOLDS NO.
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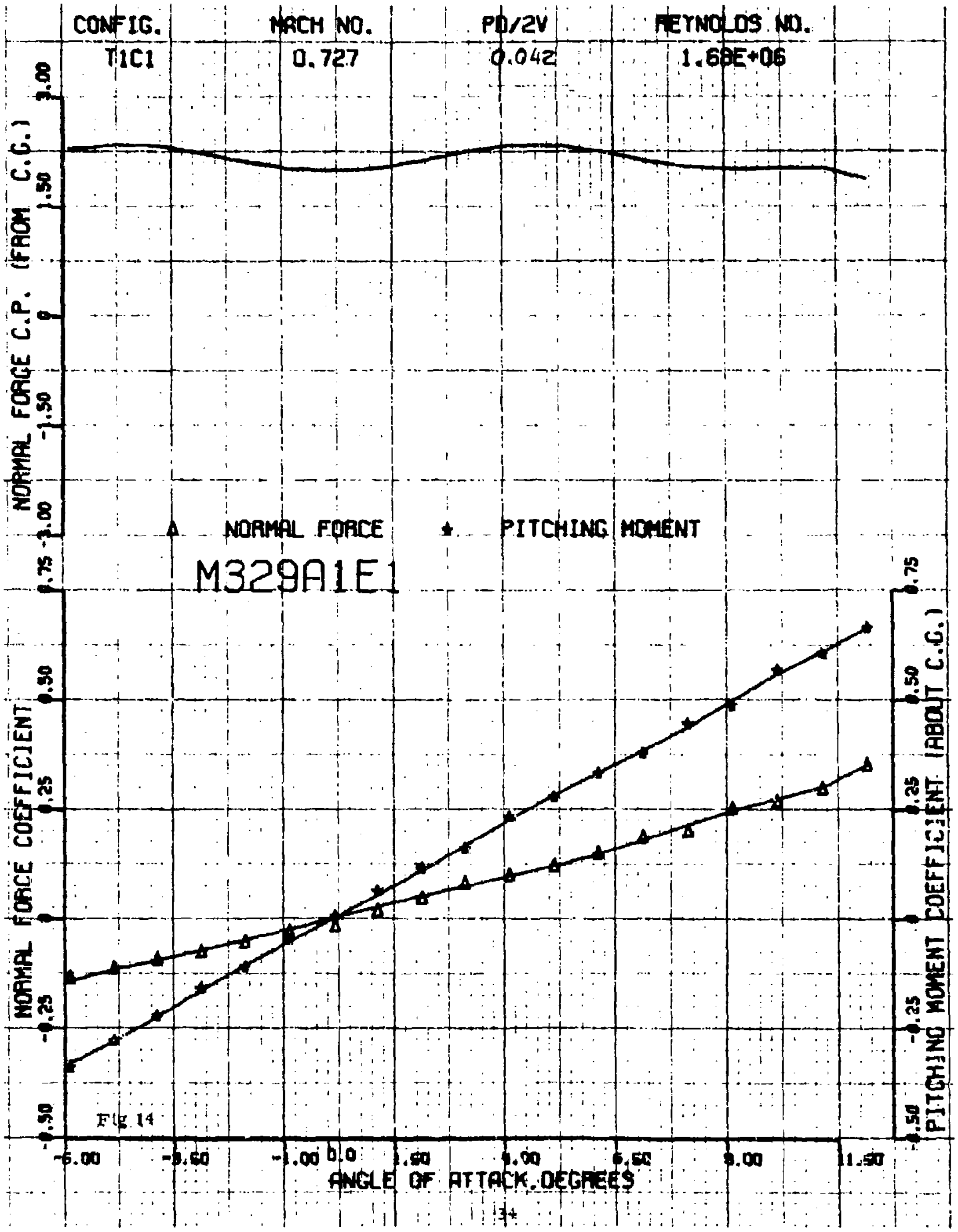
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 13



CONFIG.
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PD/2V
0.042
REYNOLDS NO.
1.68E+06
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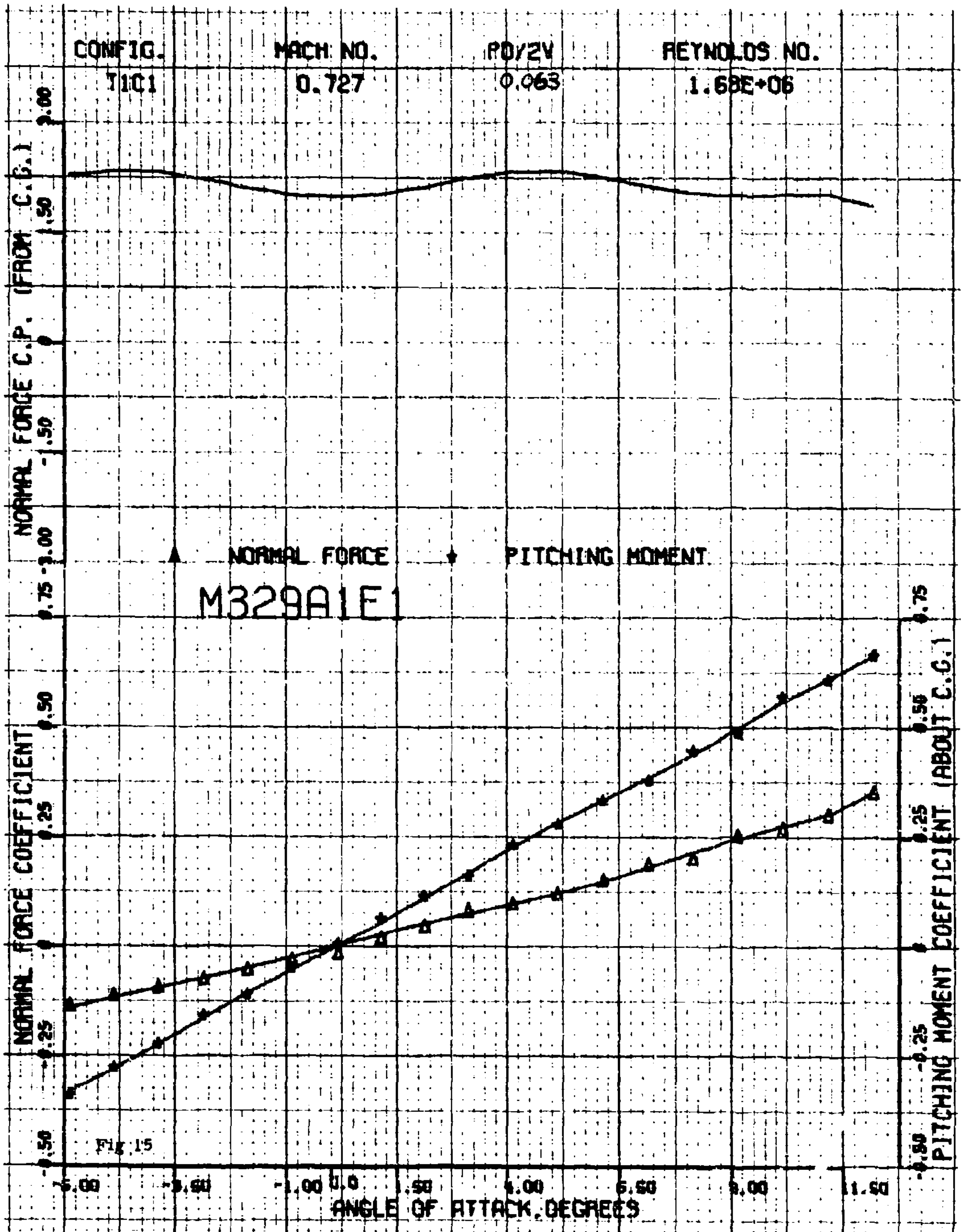
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
0.75
0.50
0.25
0
-0.25
-0.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 14
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK, DEGREES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PD/2V
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REYNOLDS NO.
1.68E+06
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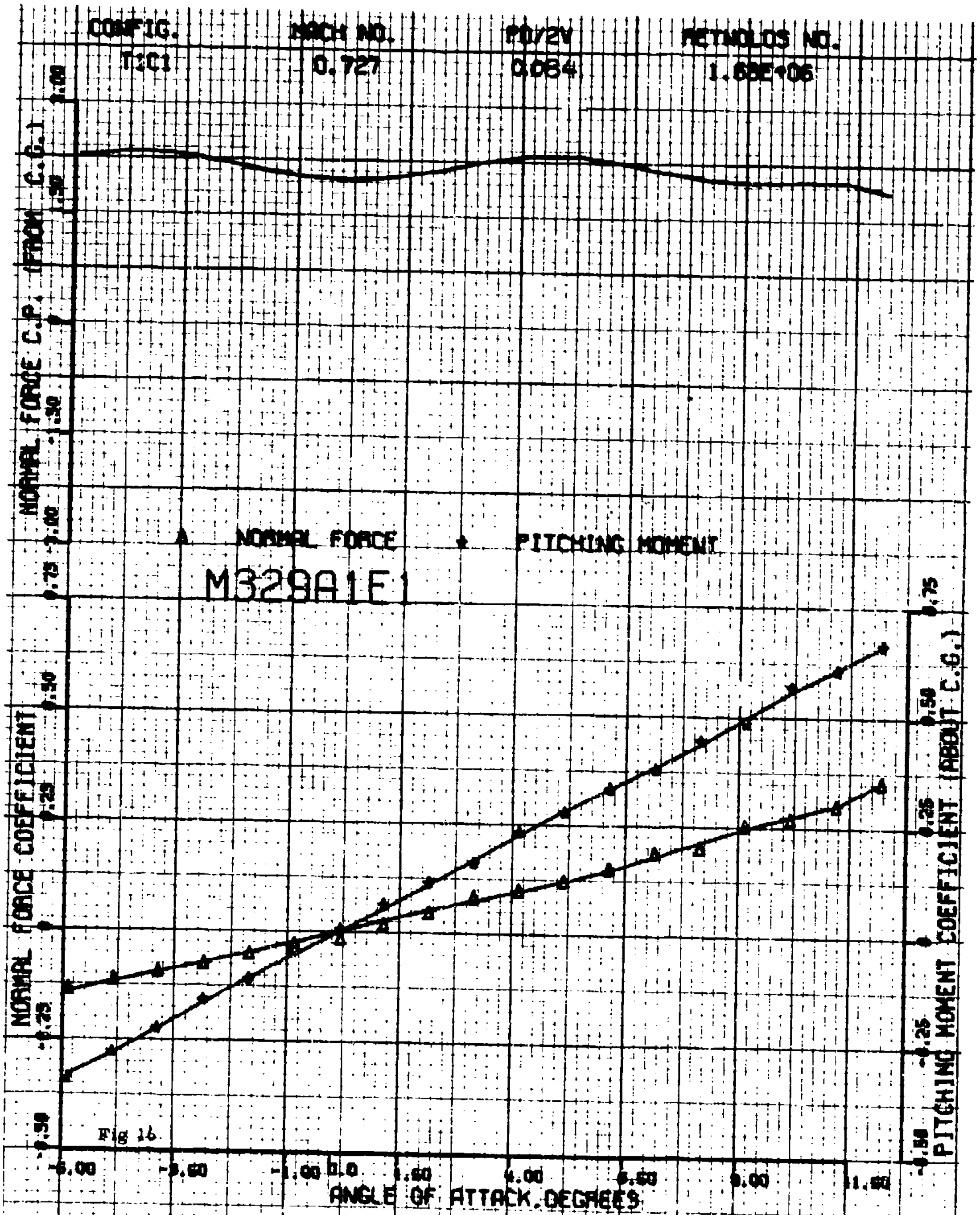
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 15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0.727
PD/2V
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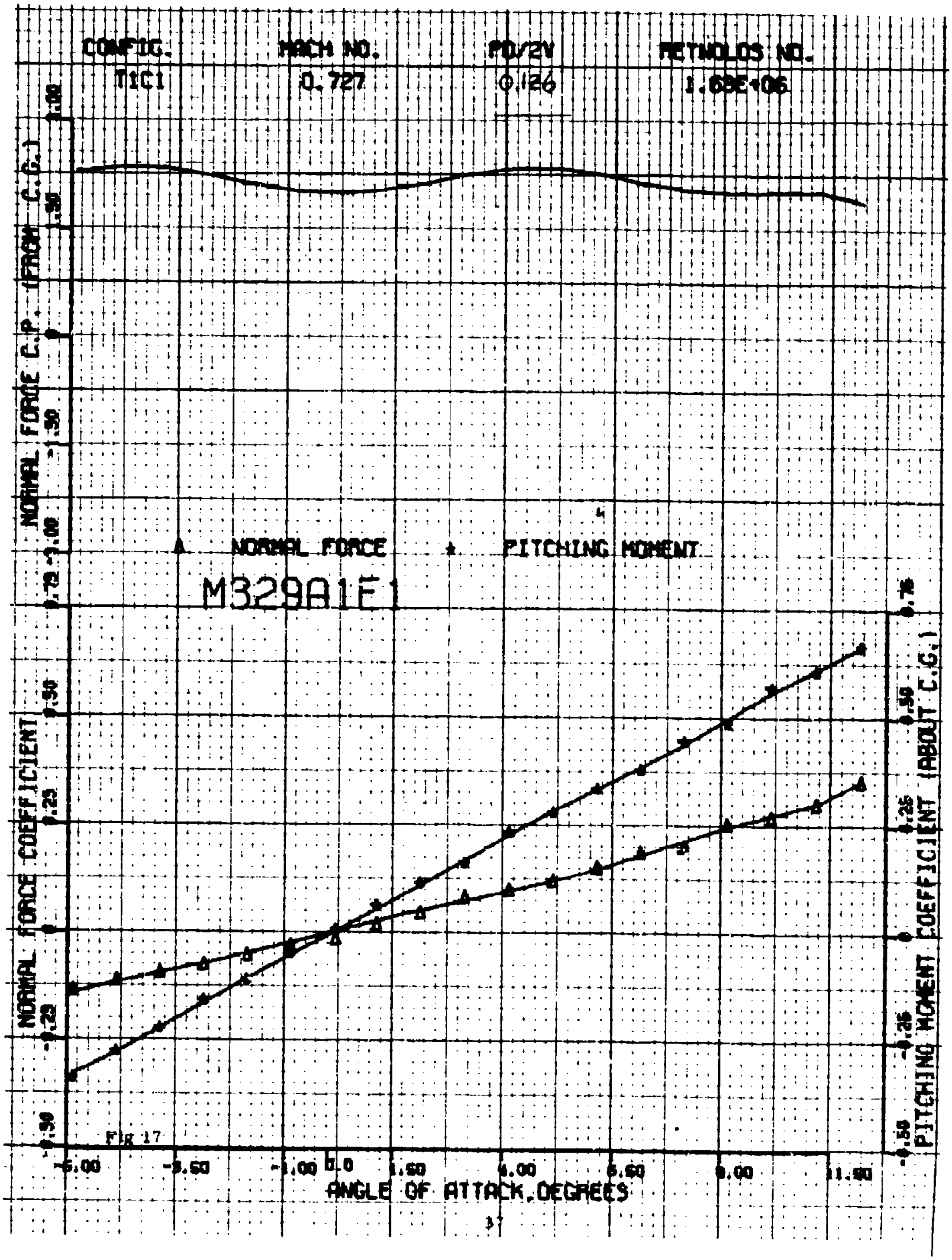
REYNOLDS NO.
1.68E+06
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 16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PD/2V
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REYNOLDS NO.
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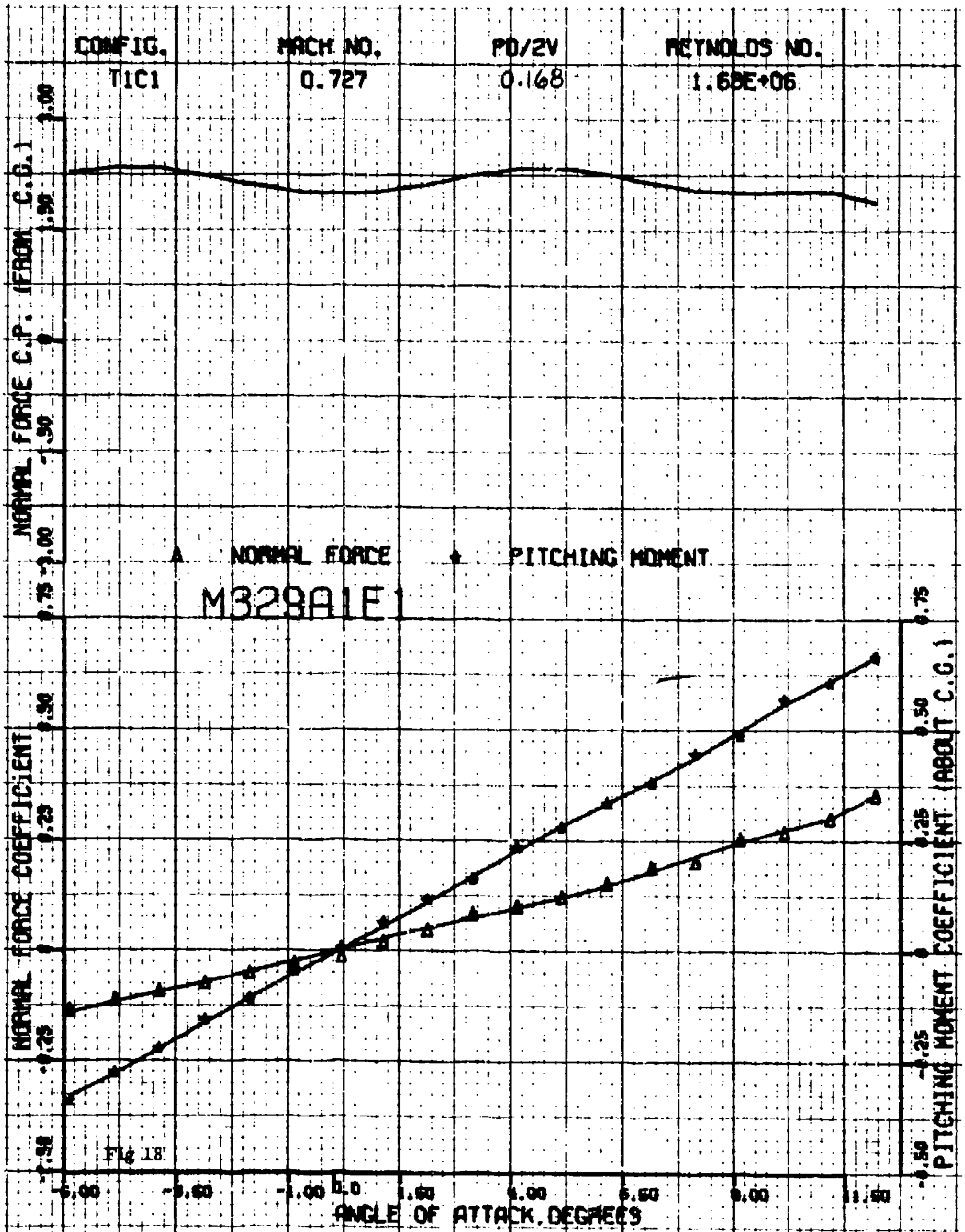
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 17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PD/2V
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REYNOLDS NO.
1.68E+06
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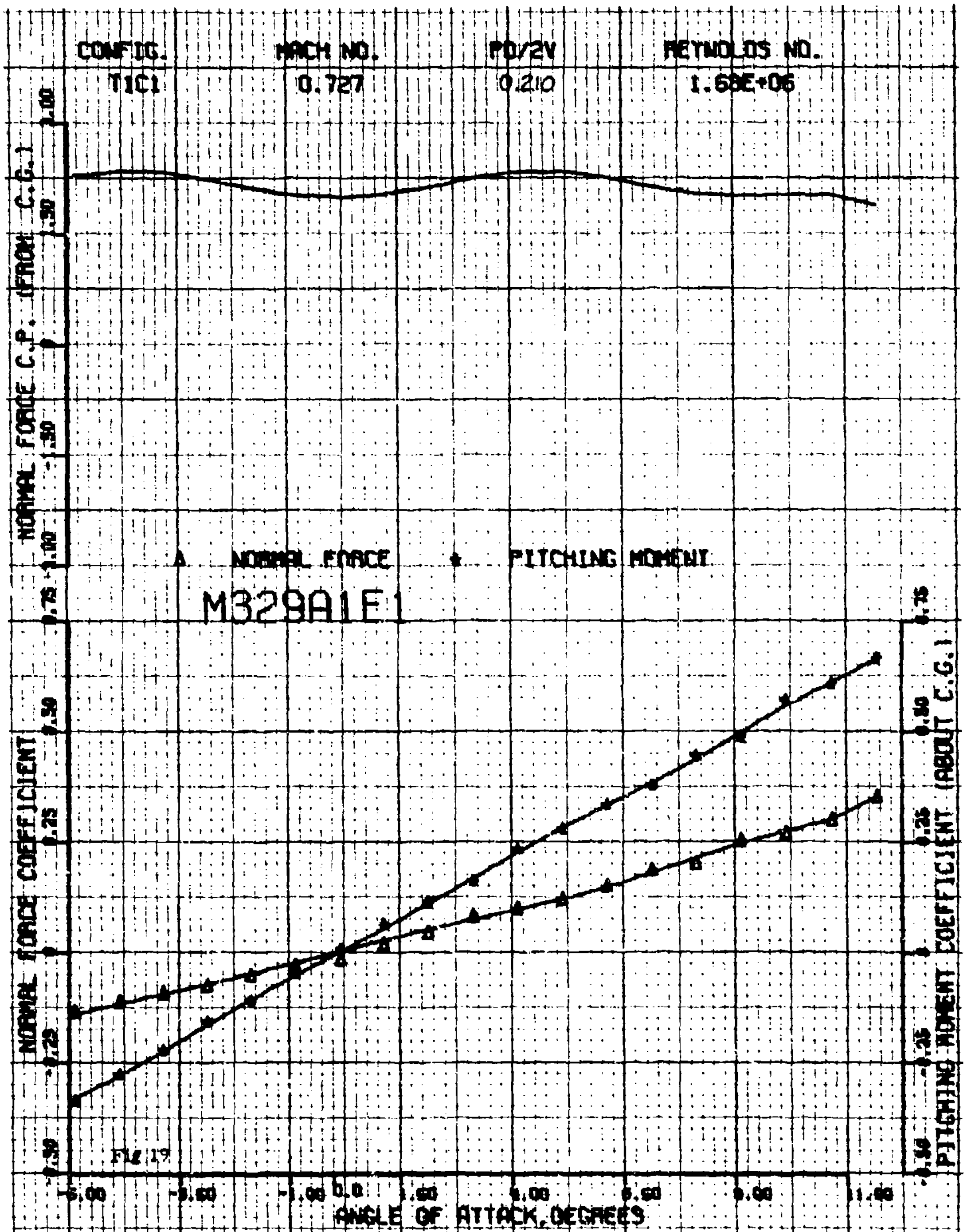
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 18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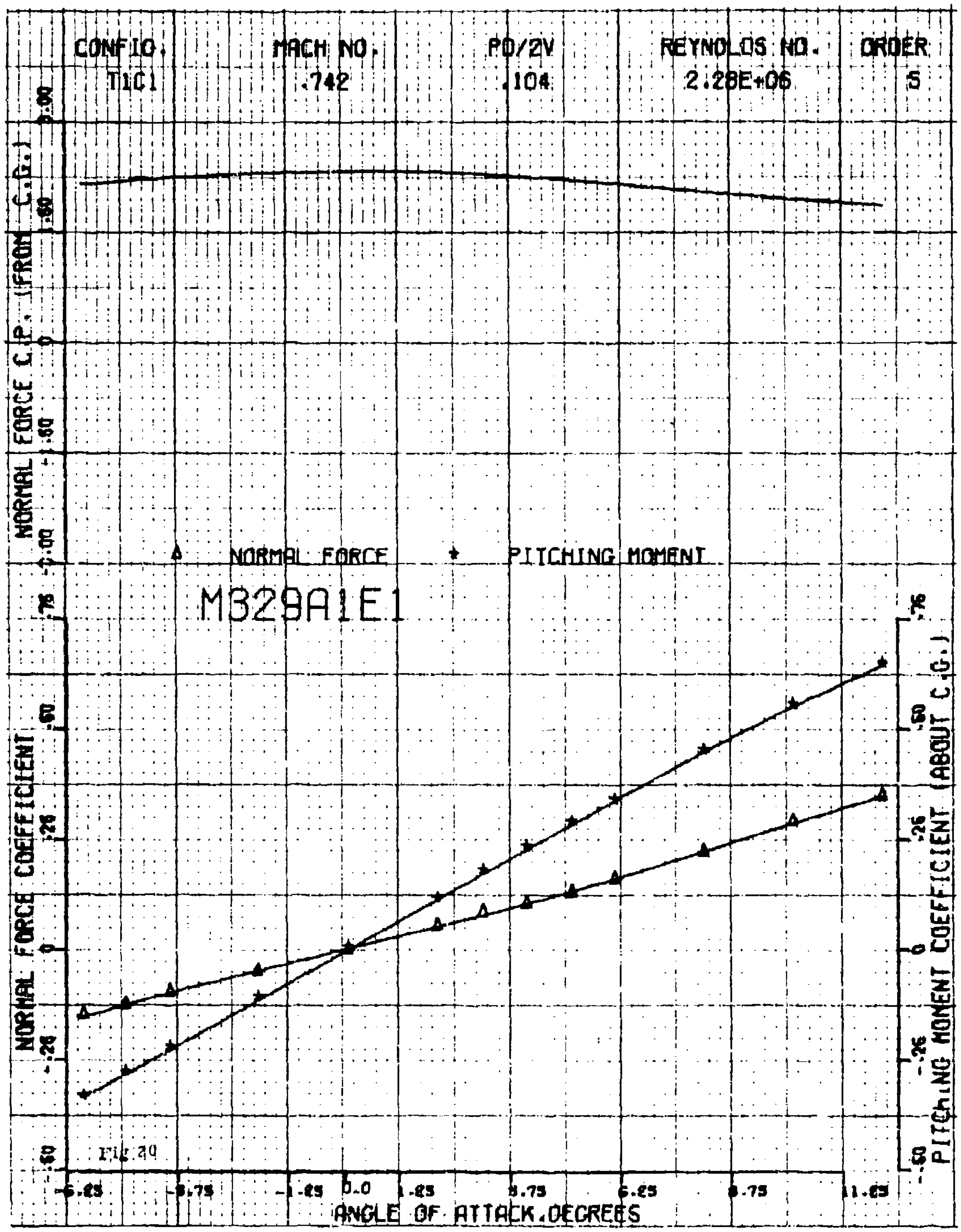
PD/2V
0.210
REYNOLDS NO.
1.68E+06
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 17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REYNOLDS NO. 2.28E+06
ORDER 5
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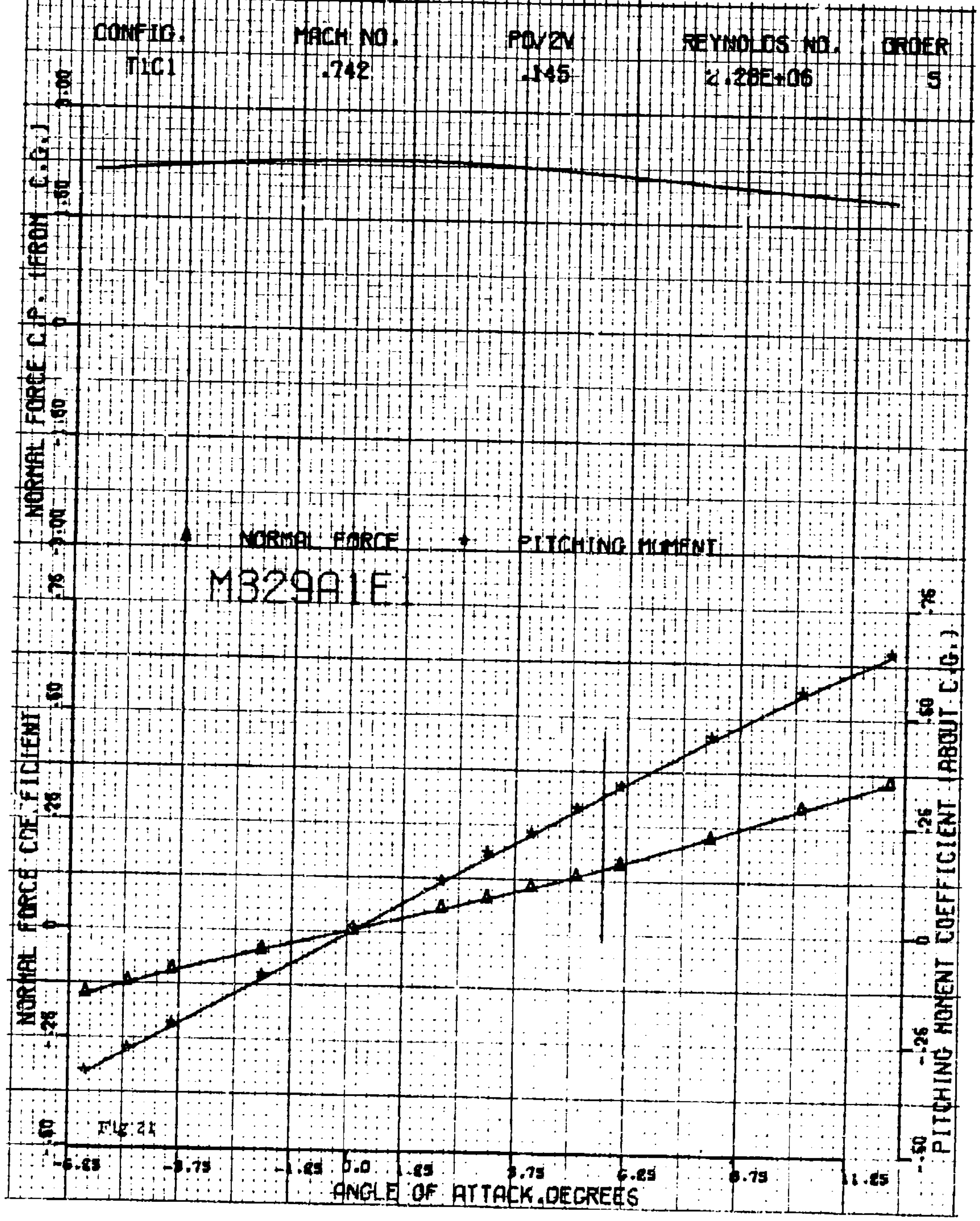
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 39



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PD/2V
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REYNOLDS NO.
2.28E+06
ORDER
5
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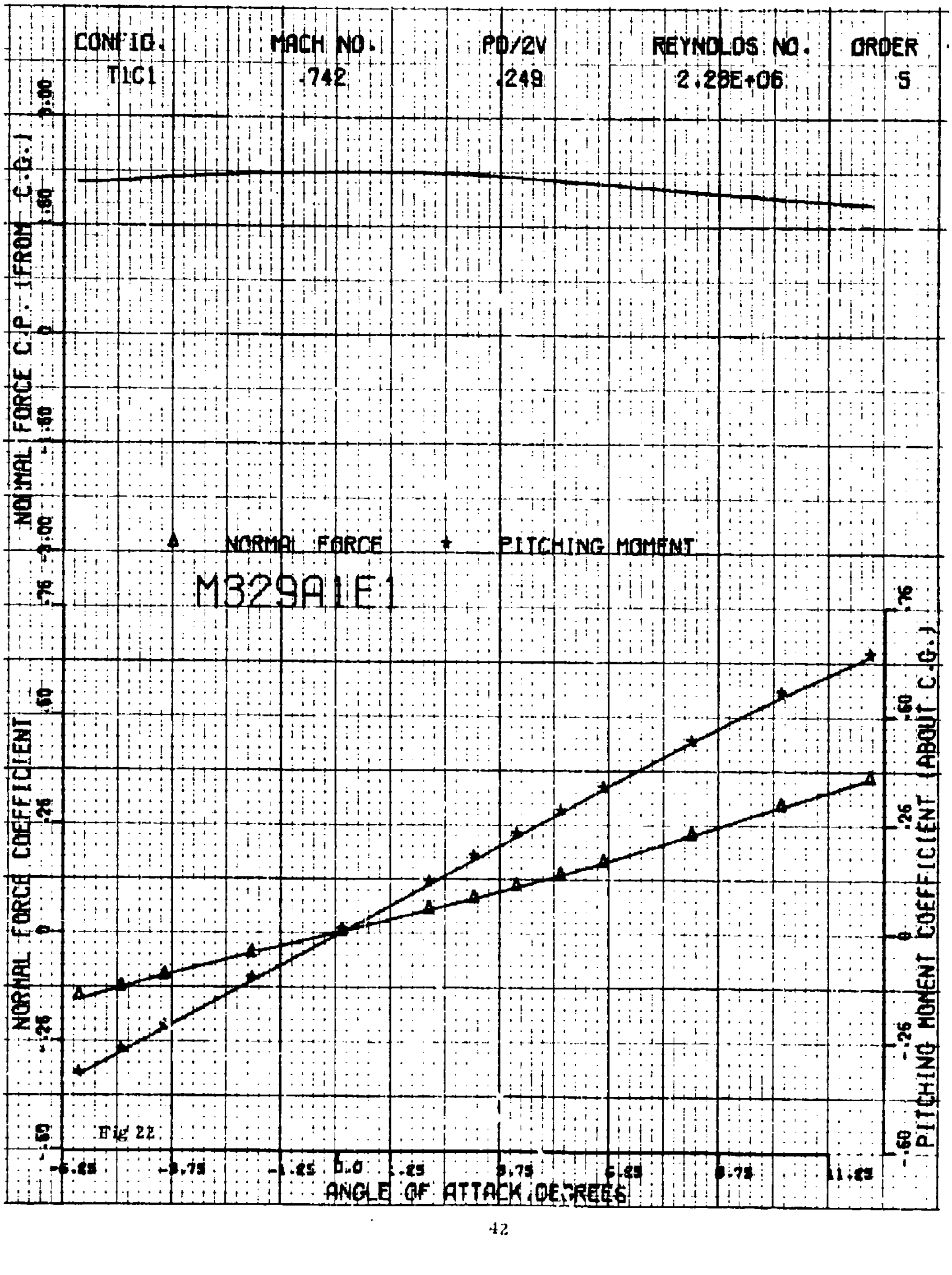
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 21
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK,DEGREES



CONFIG.
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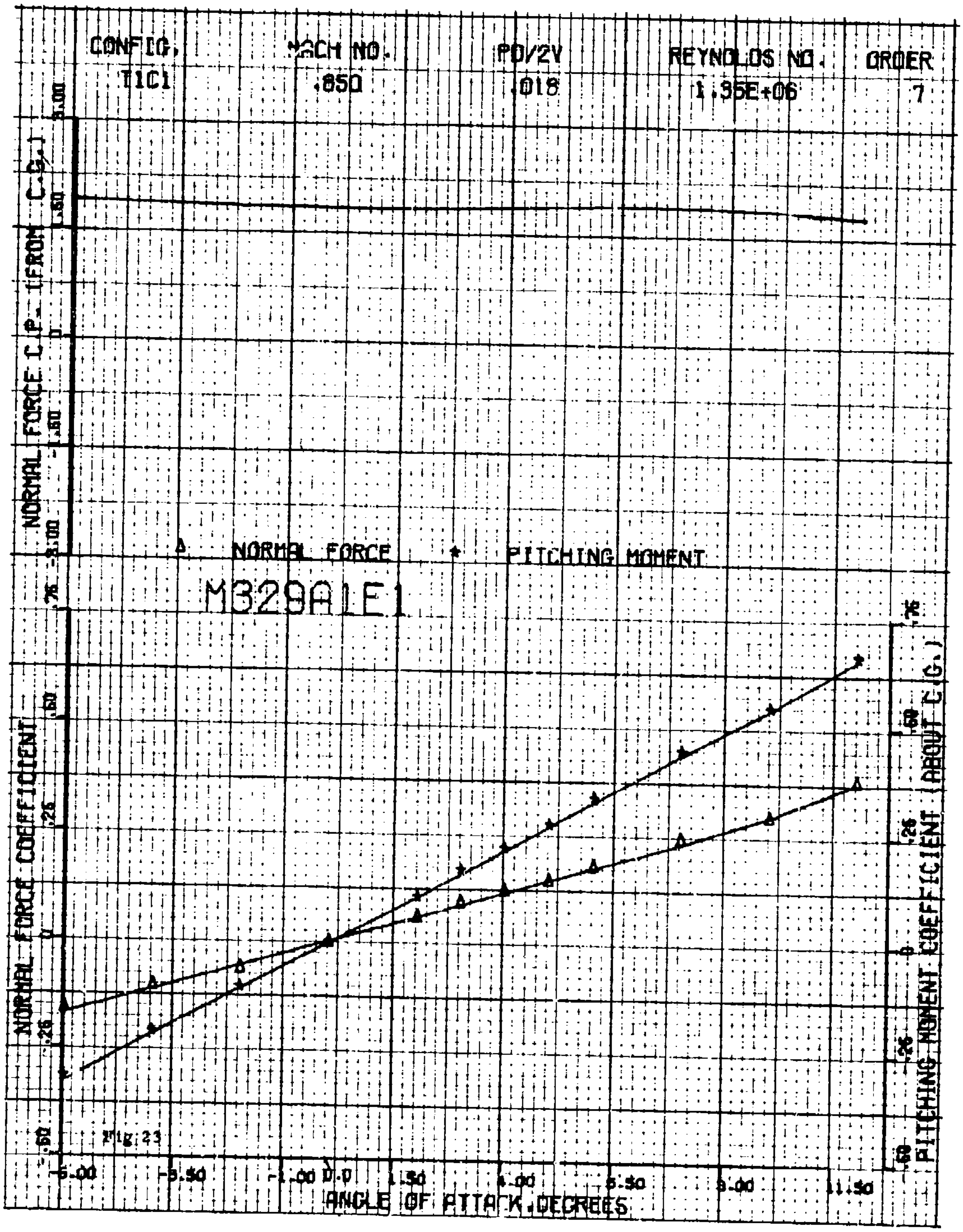
MACH NO.
.742
PD/2V
.249
REYNOLDS NO.
2.28E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK DEGREES

Fig 22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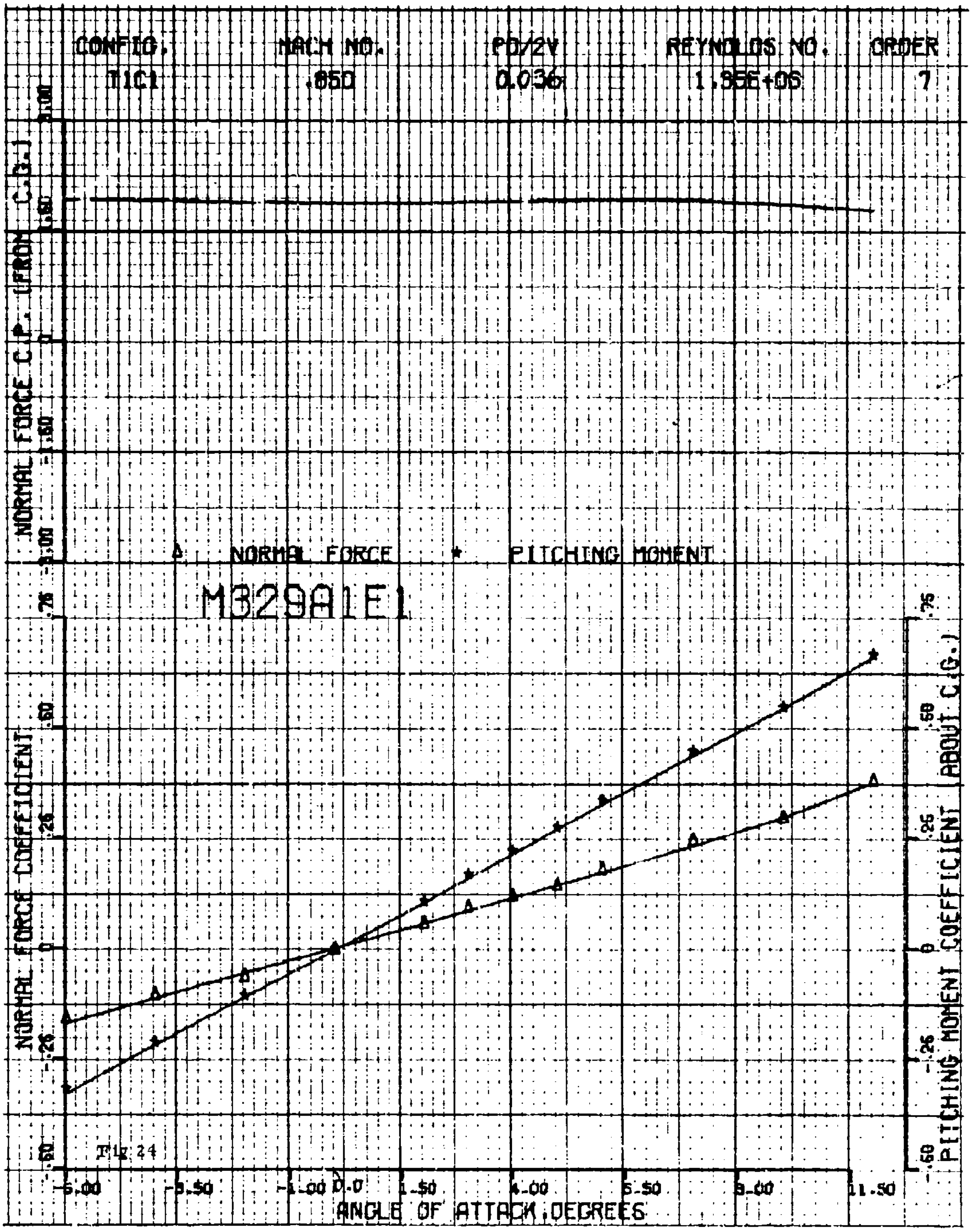
PD/2V
.018
REYNOLDS NO.
1.35E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Δ NORMAL FORCE
* PITCHING MOMENT
M329A1E1
Fig 23
ANGLE OF ATTACK,DEGREES



CONFIG.
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REYNOLDS NO.
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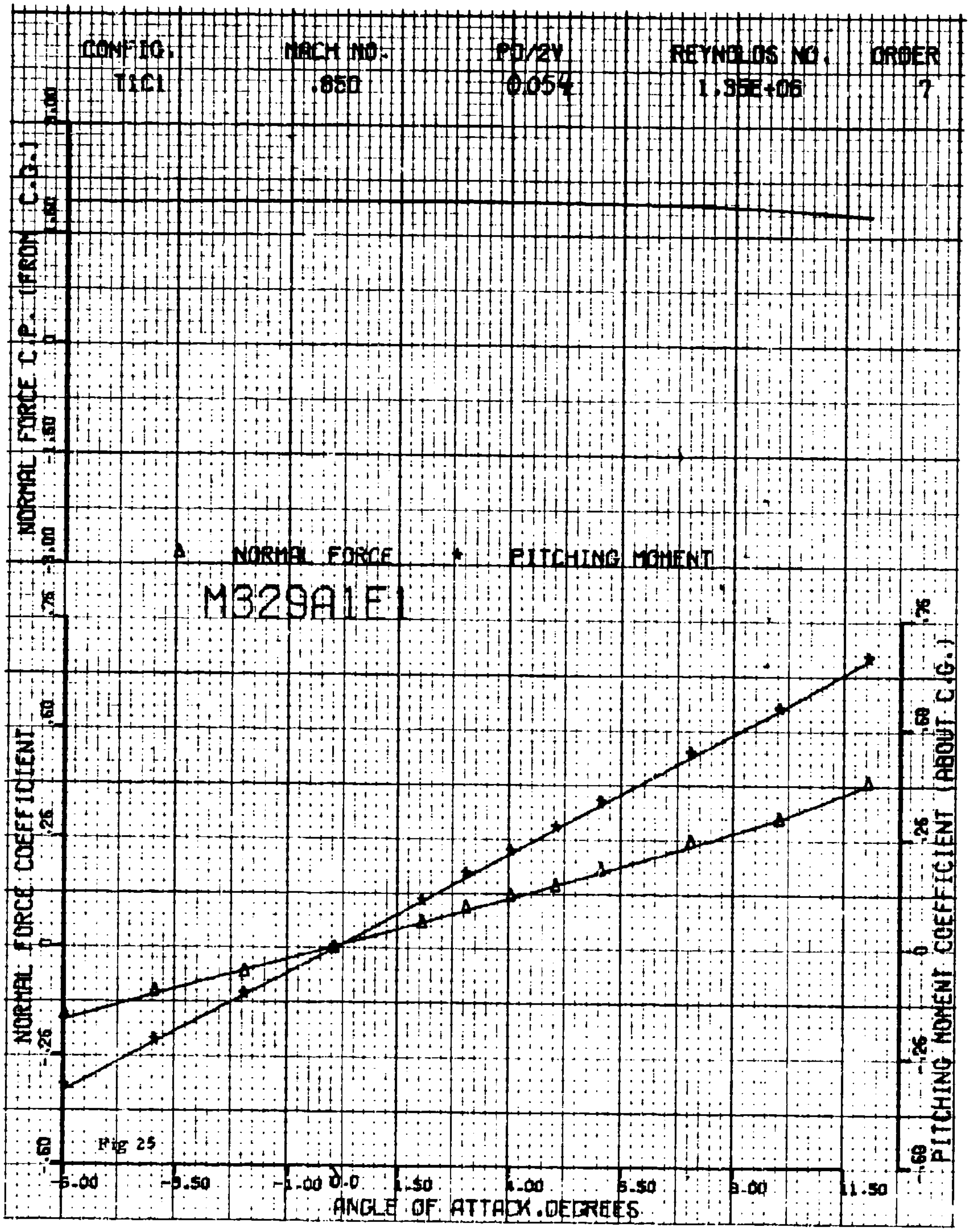
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT ABOUT C.G.)
Fig 24
ANGLE OF ATTACK,DEGREES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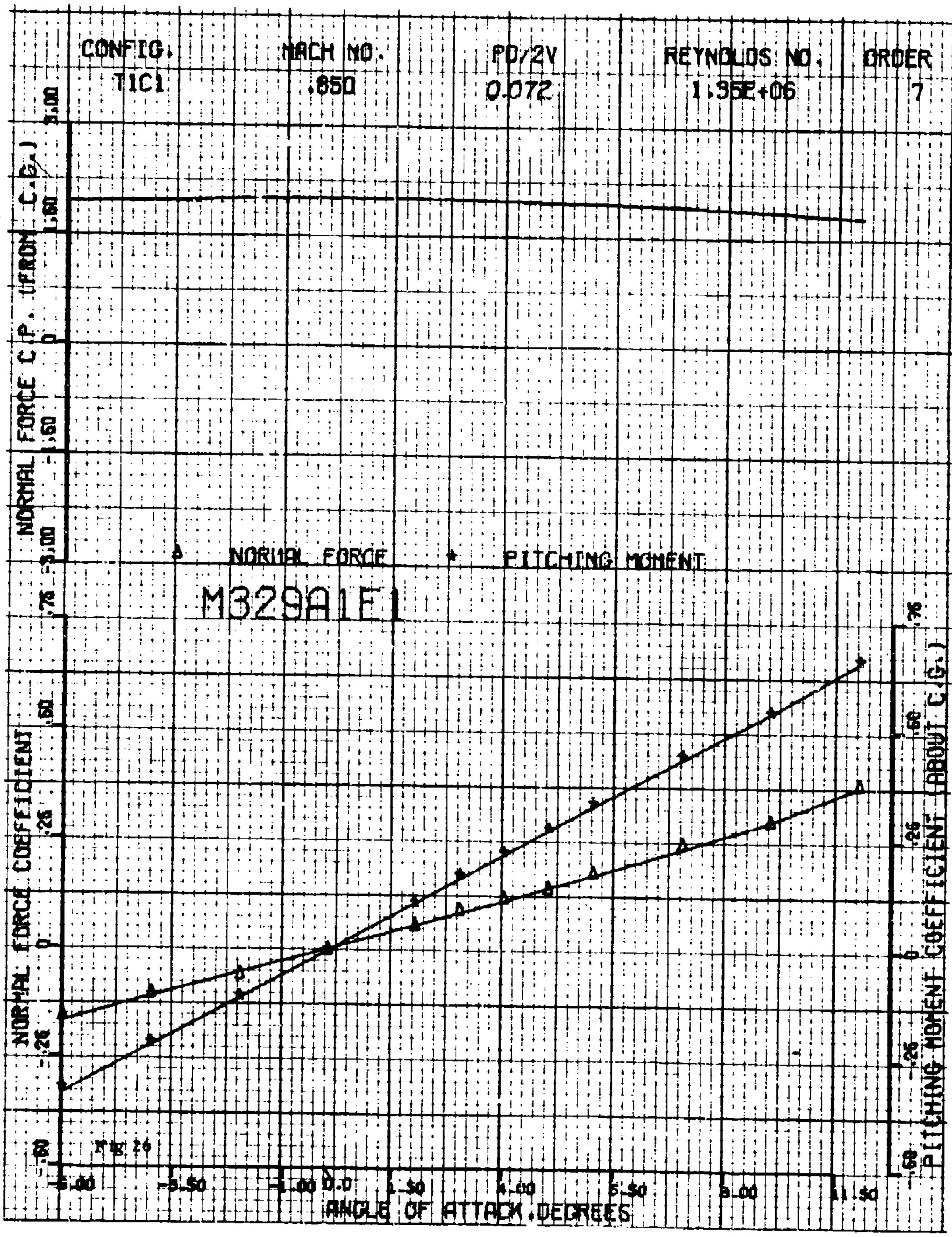
Δ NORMAL FORCE
* PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 25



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PD/2V
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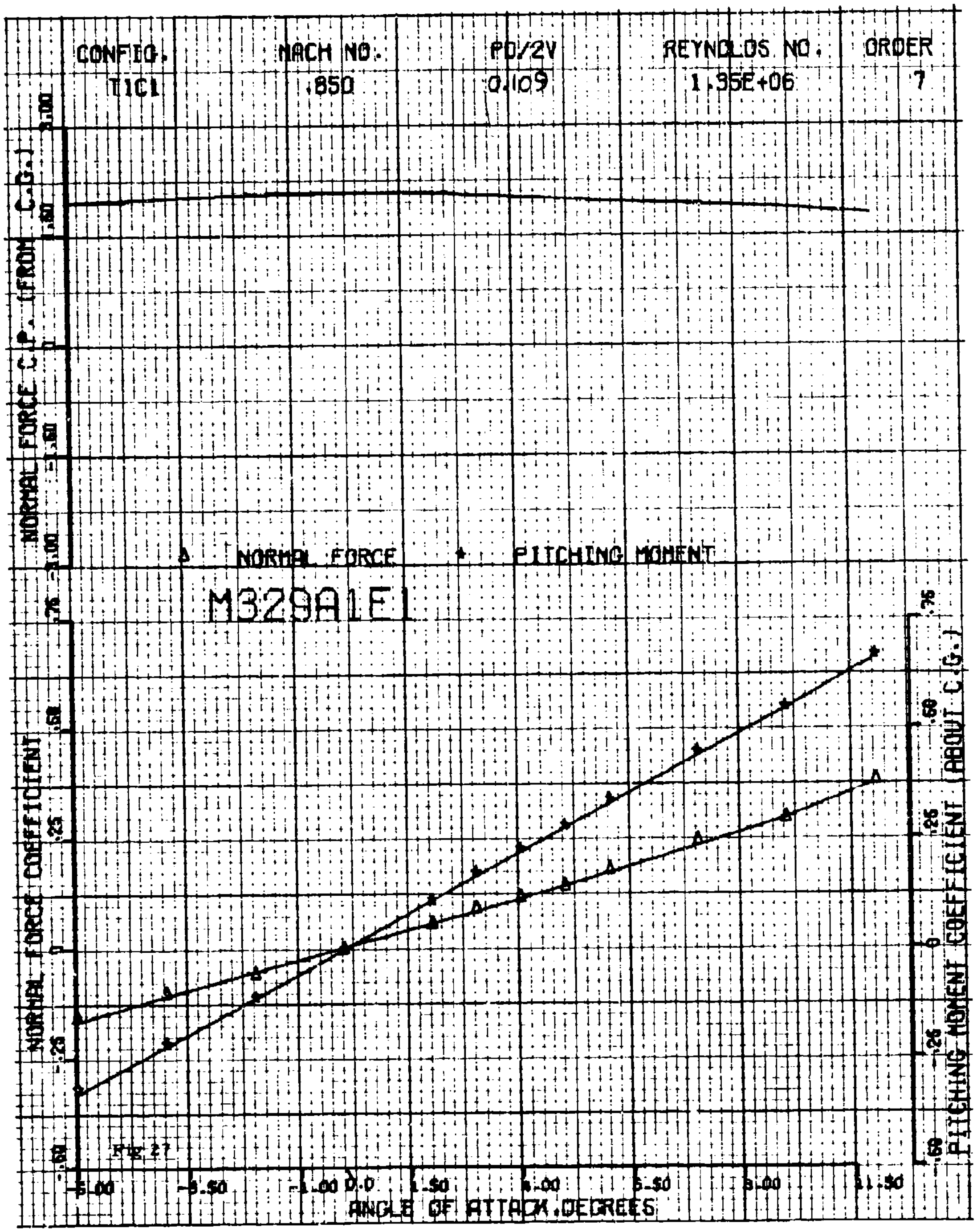
REYNOLDS NO.
1.35E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 26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PD/2V
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REYNOLDS NO.
1.35E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 27
ANGLE OF ATTACK,DEGREES

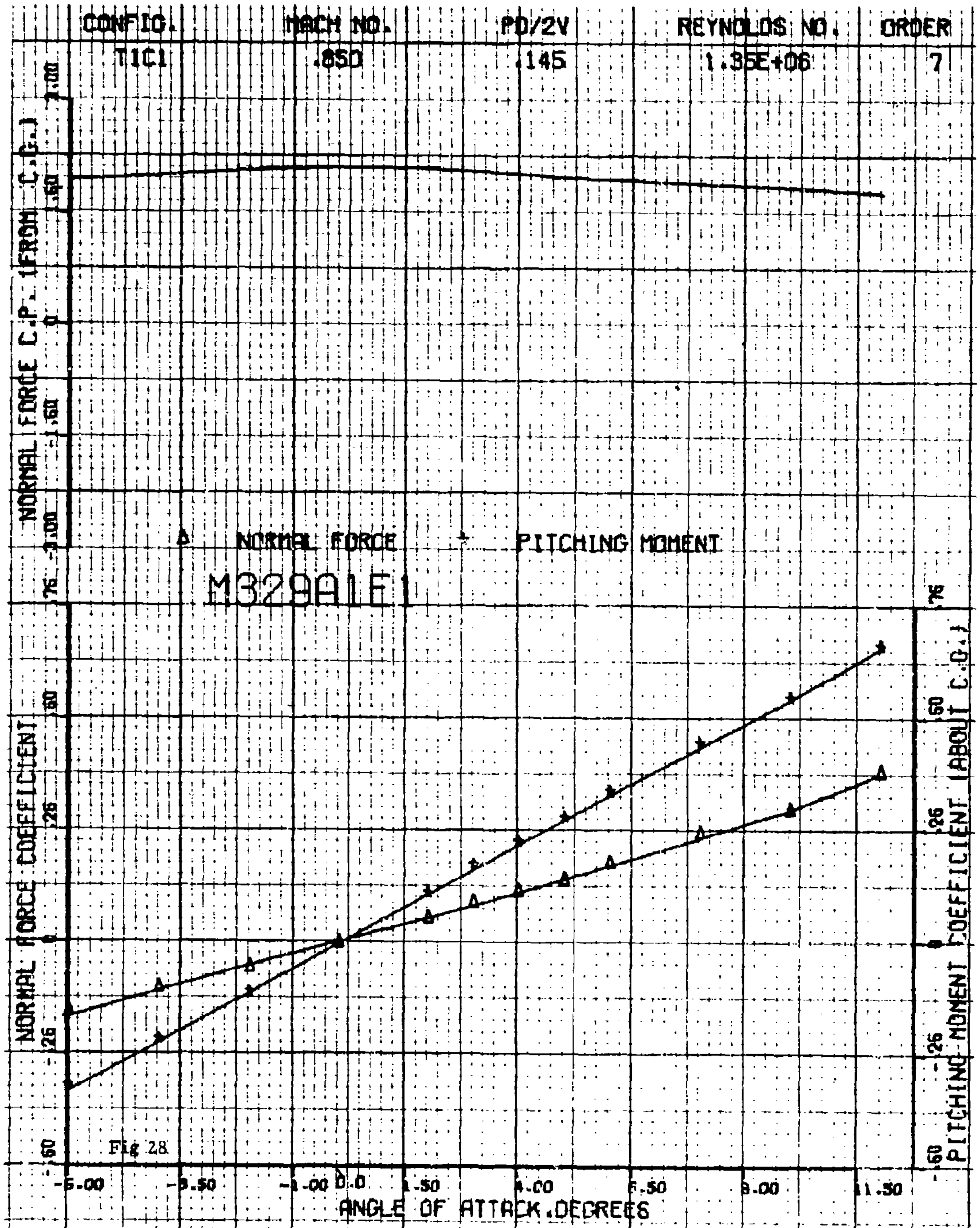
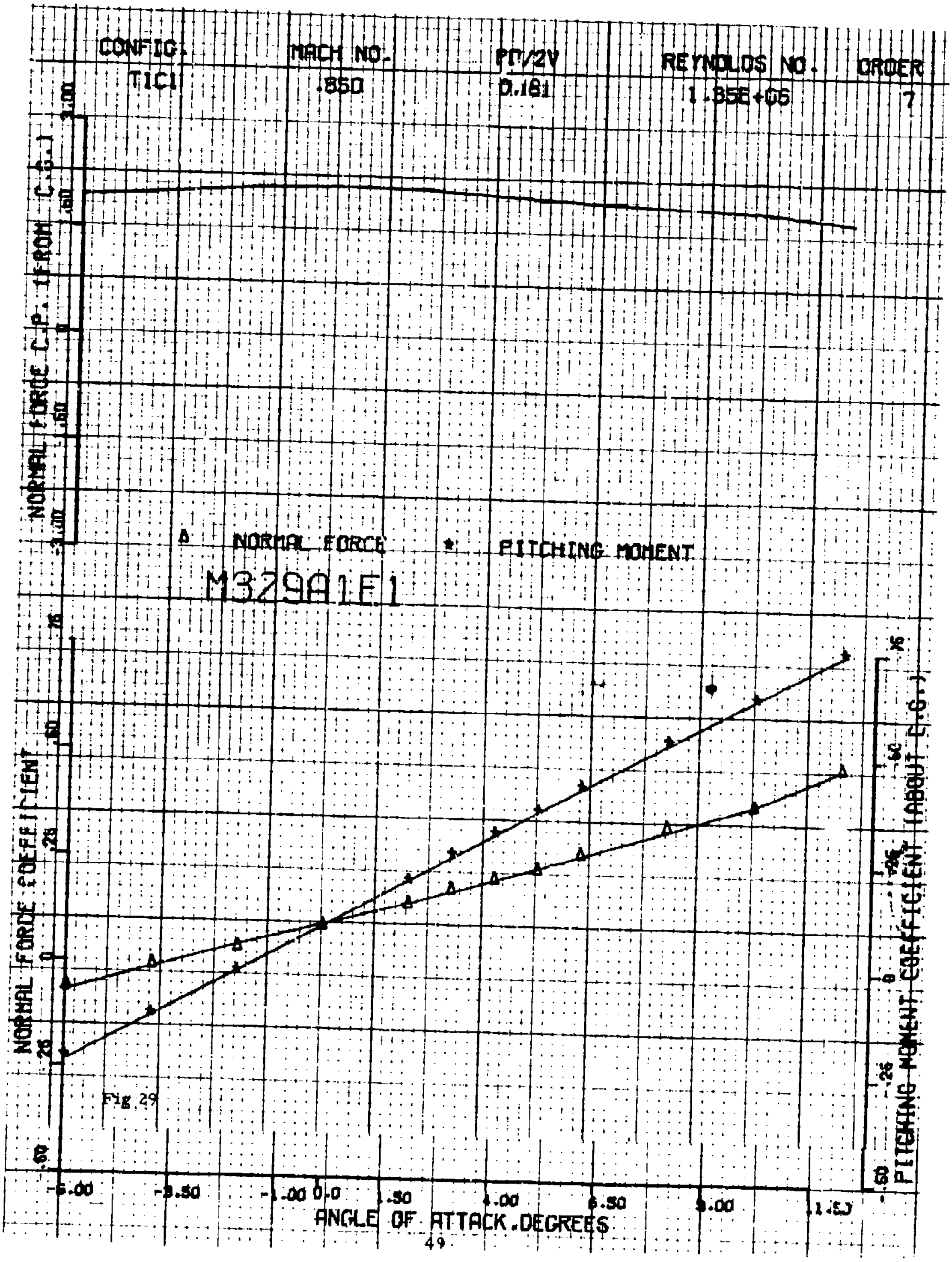
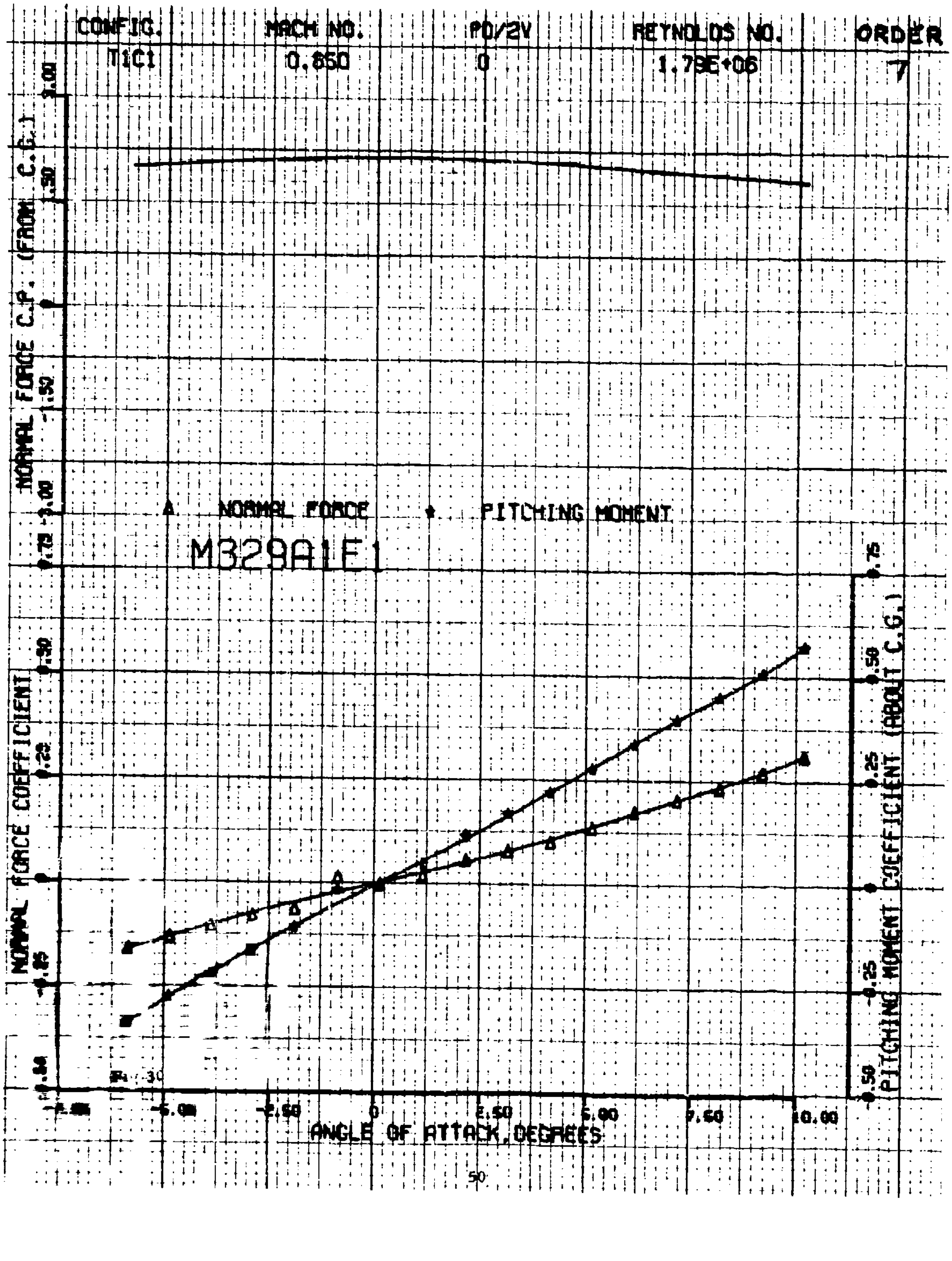

CONFIG.
T1C1
MACH NO.
.850
PD/2V
.145
REYNOLDS NO.
1.35E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 28

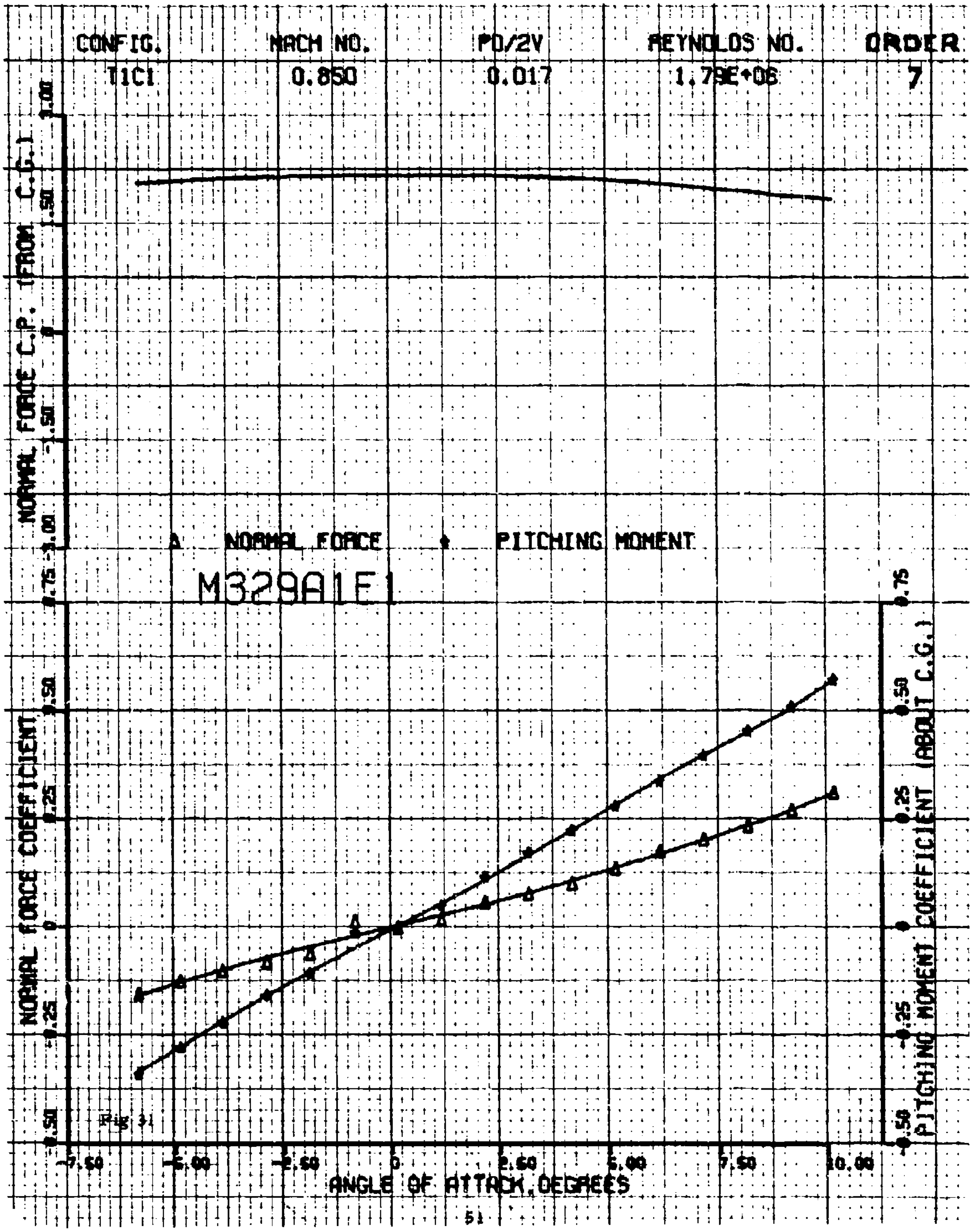


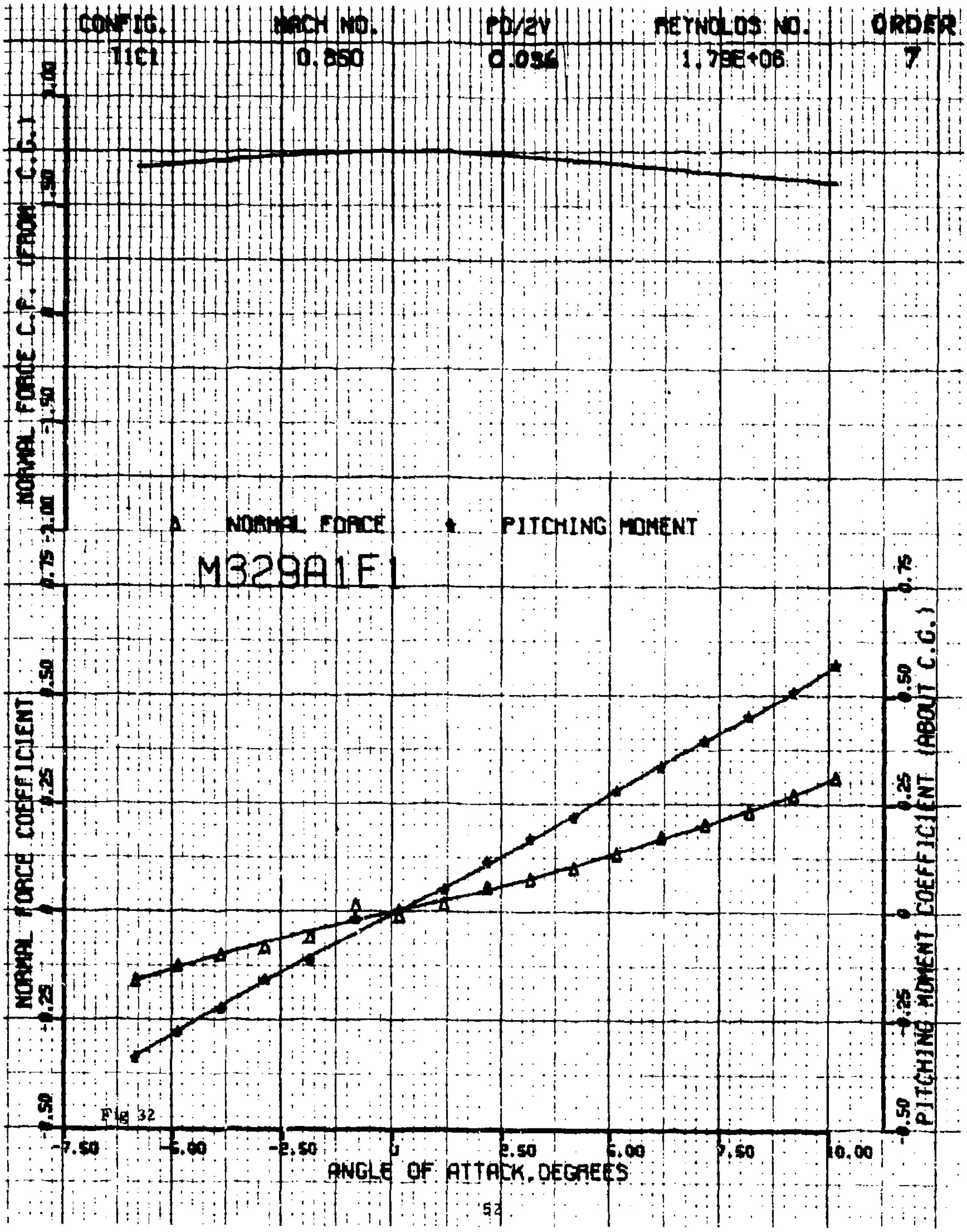
CONFIG.
T1C1
MACH NO.
.850
PD/2V
0.181
REYNOLDS NO.
1.35E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK.DEGREES

Fig 29



CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-5.00
-2.50
0
2.50
5.00
7.50
10.00


CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.017
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
Fig 31



CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 0.850 0.036 1.79E+06 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 32

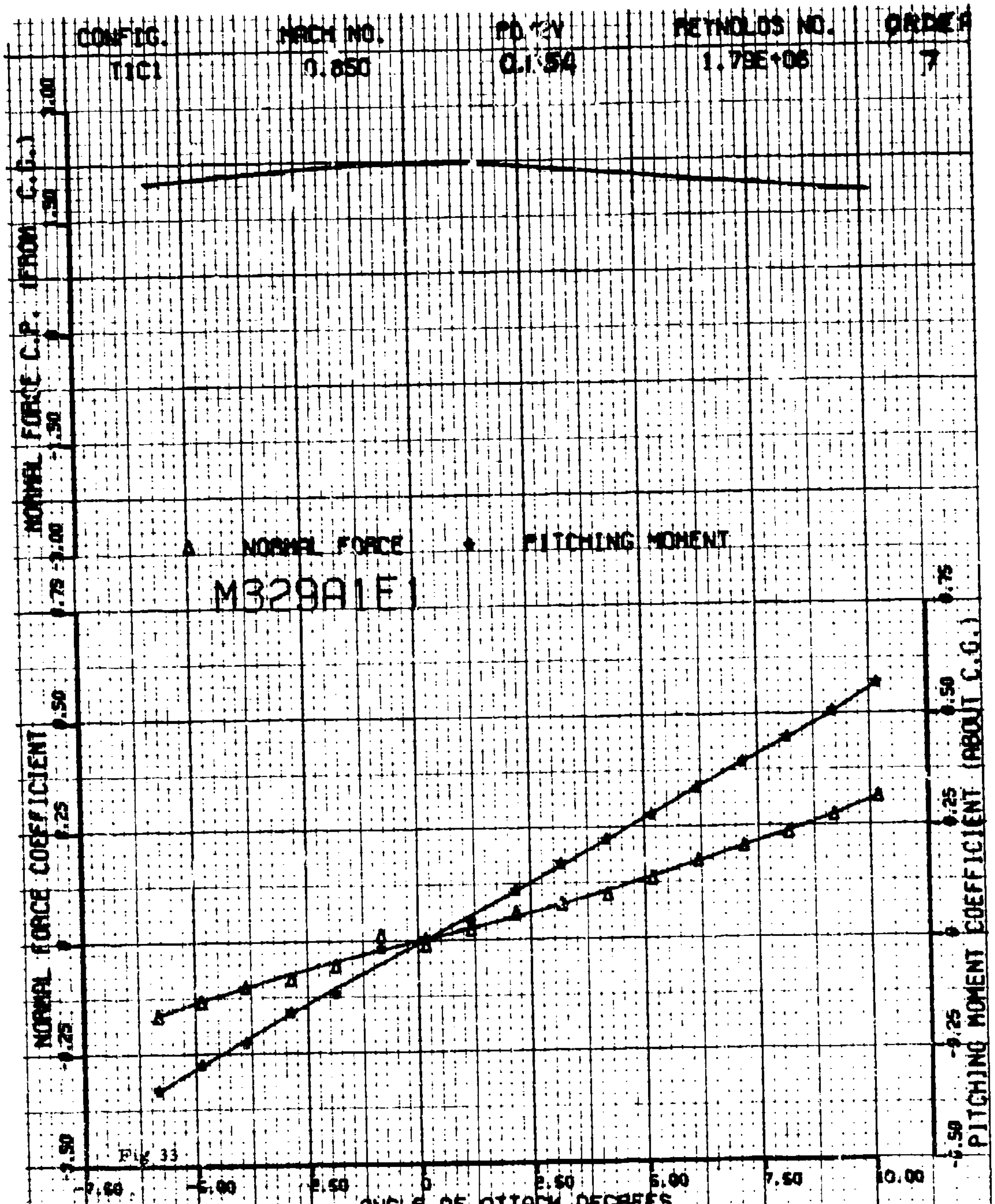
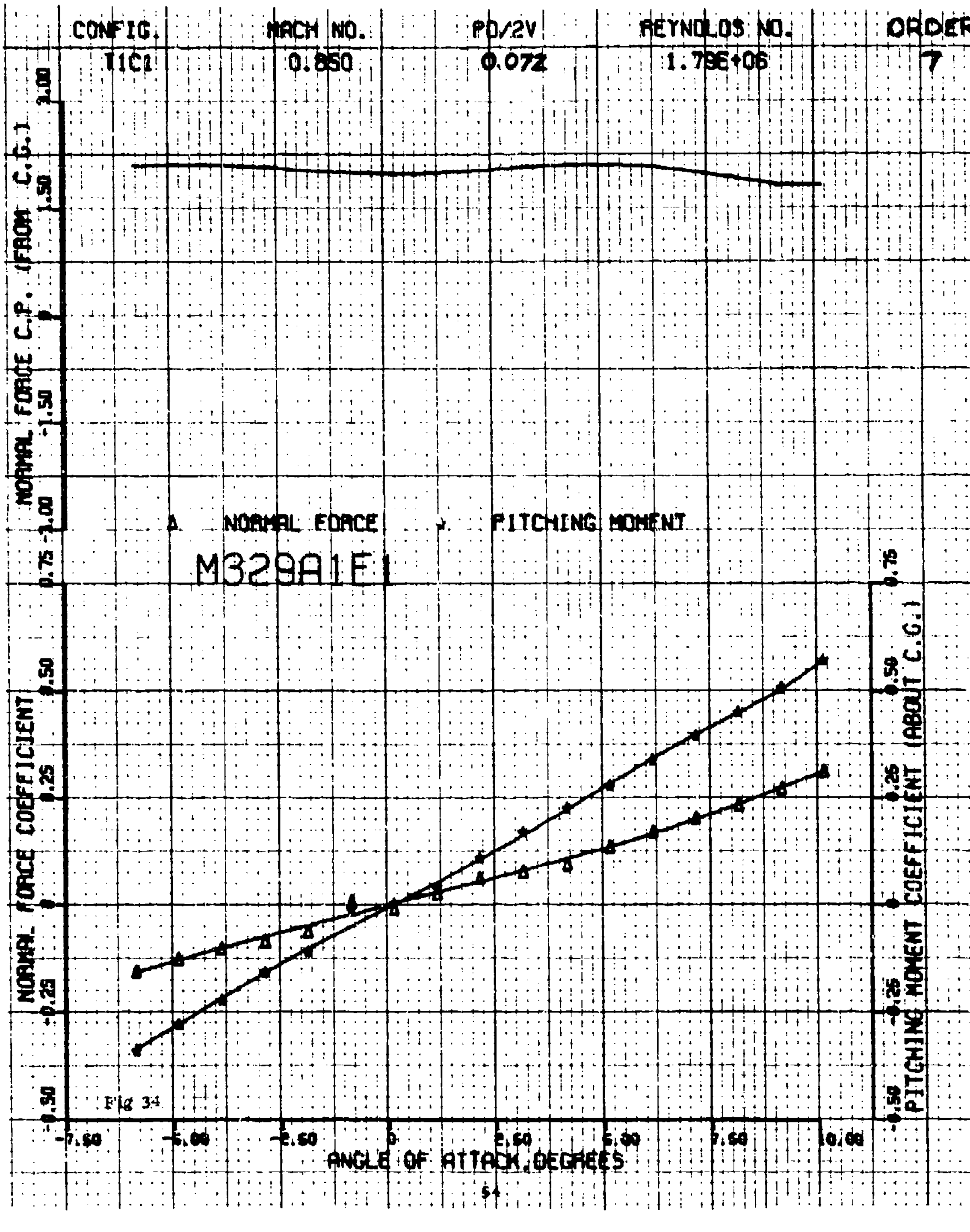

CONFIG.
TIC1
MACH NO.
0.850
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 33



CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.072
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 34

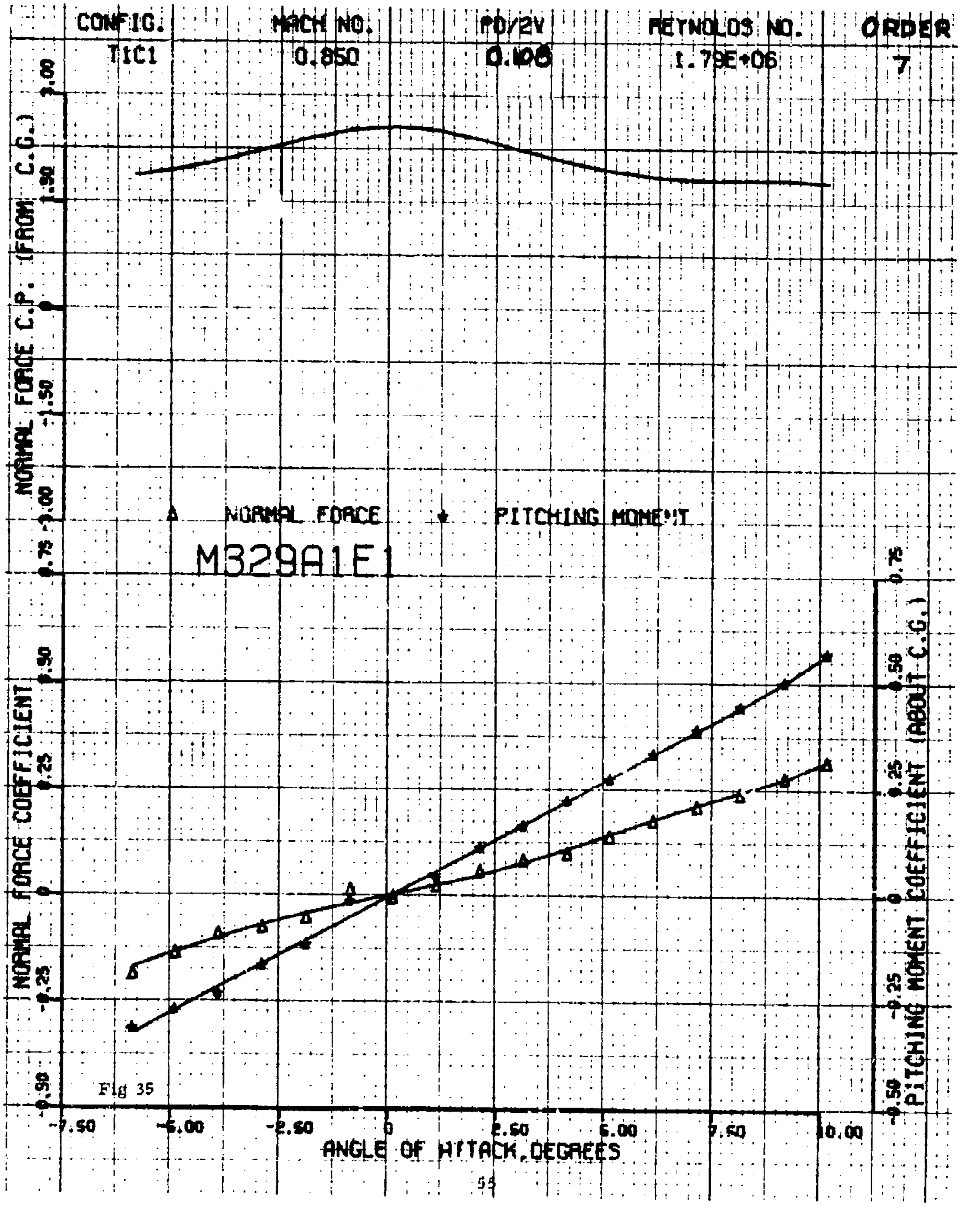

CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.008
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 35

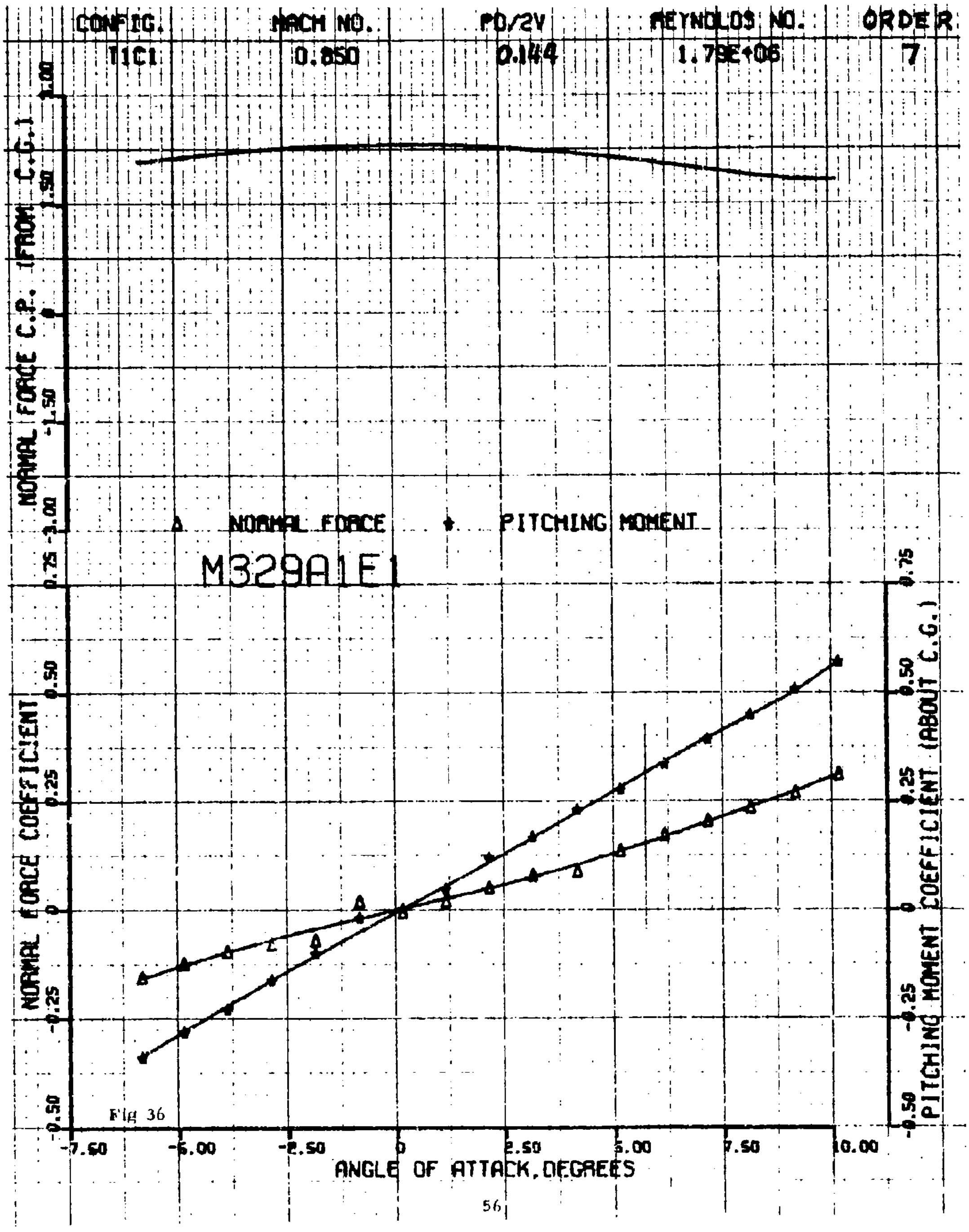
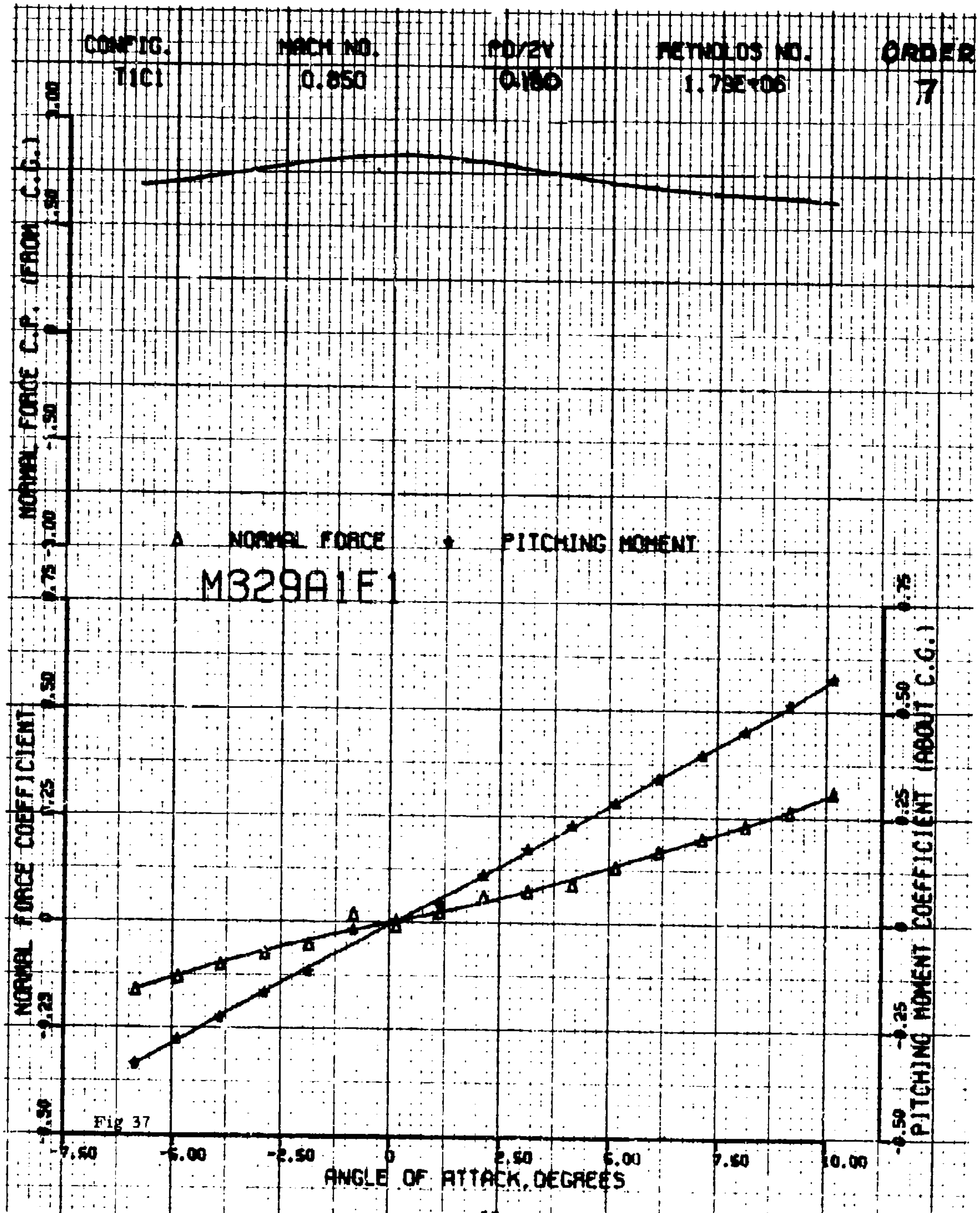

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 0.850 0.144 1.79E+06 7
NORMAL FORCE C.P. (FROM C.G.)
Δ NORMAL FORCE ✱ PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50 -5.00 -2.50 0 2.50 5.00 7.50 10.00
ANGLE OF ATTACK, DEGREES

Fig 36



CONFIG.
T1C1
MACH NO.
0.850
REYNOLDS NO.
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 37

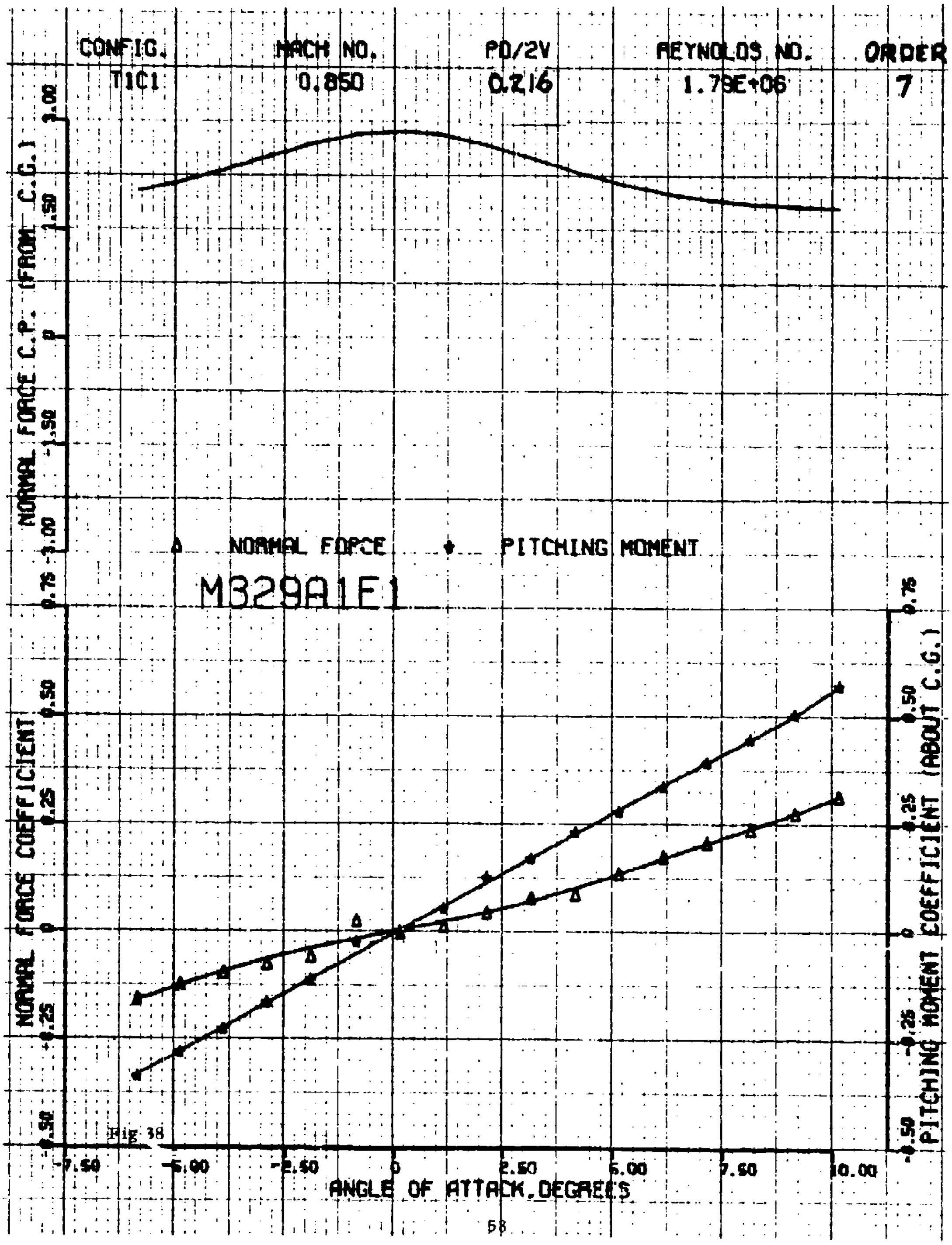

CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.216
REYNOLDS NO.
1.79E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 38

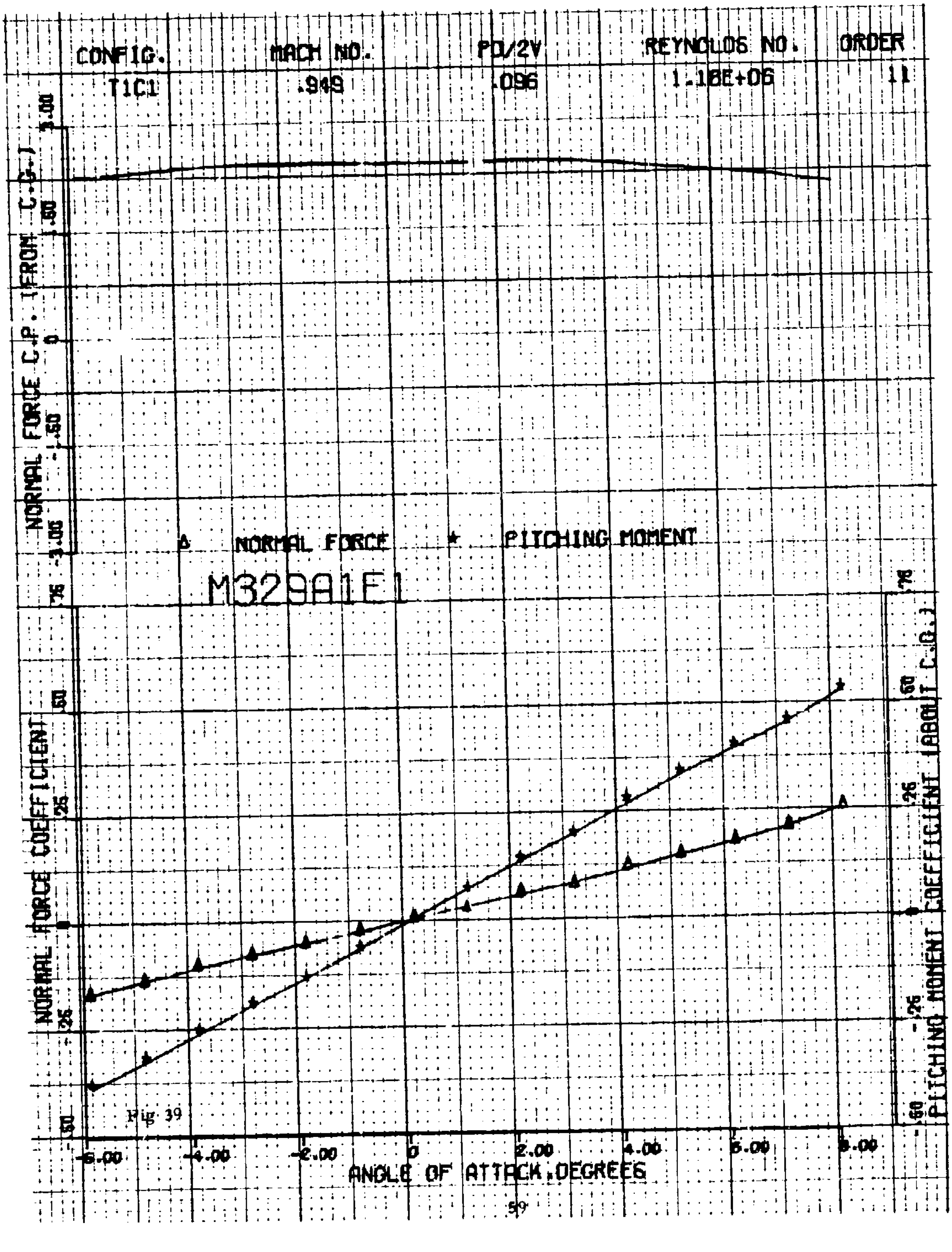
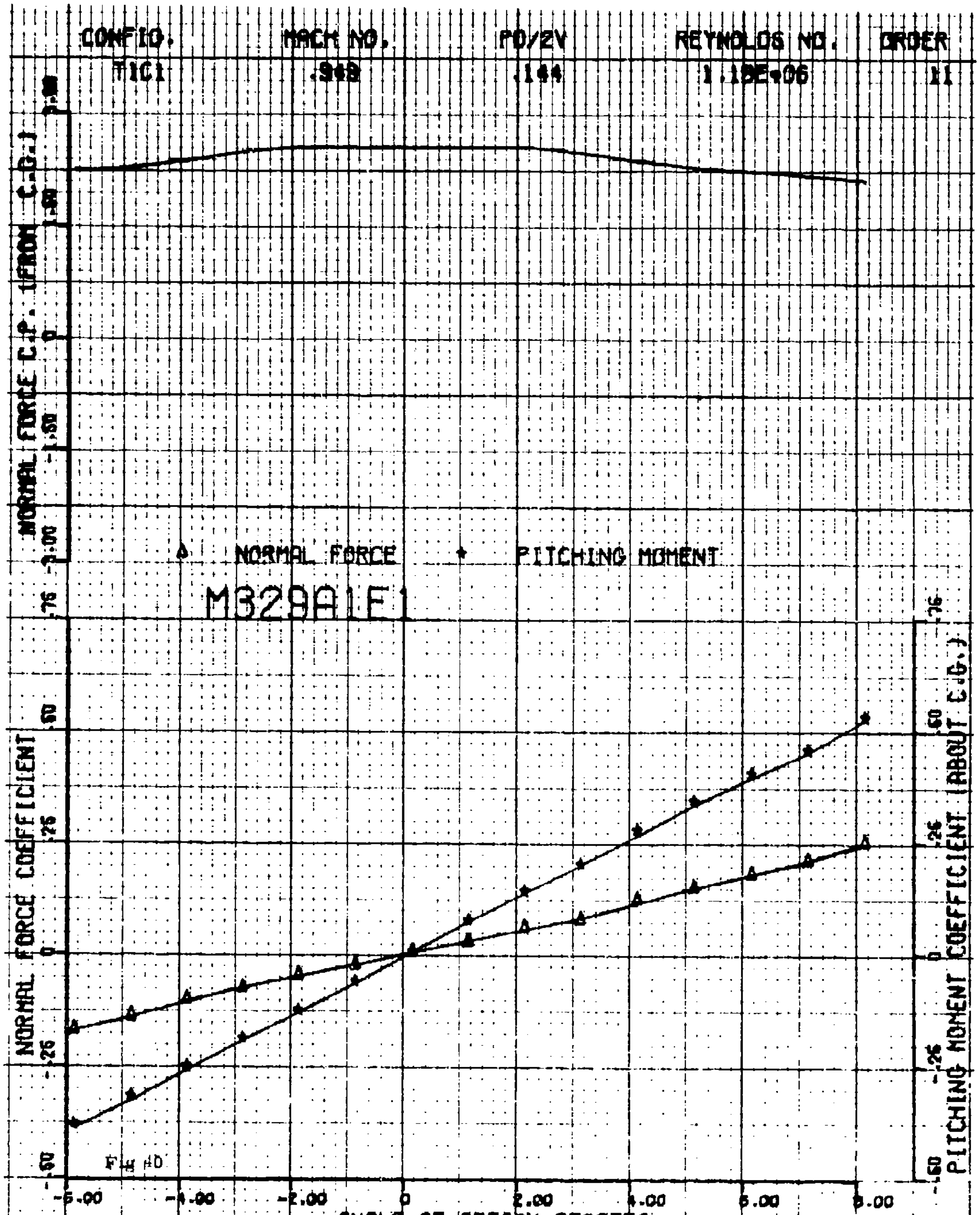

CONFIG.
T1C1
MACH NO.
.949
PD/2V
.096
REYNOLDS NO.
1.18E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-4.00
-2.00
0
2.00
4.00
6.00
8.00
ANGLE OF ATTACK, DEGREES

Fig 39



CONFIG. TIC1
MACH NO. .949
PD/2V .144
REYNOLDS NO. 1.19E+06
ORDER 11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 40

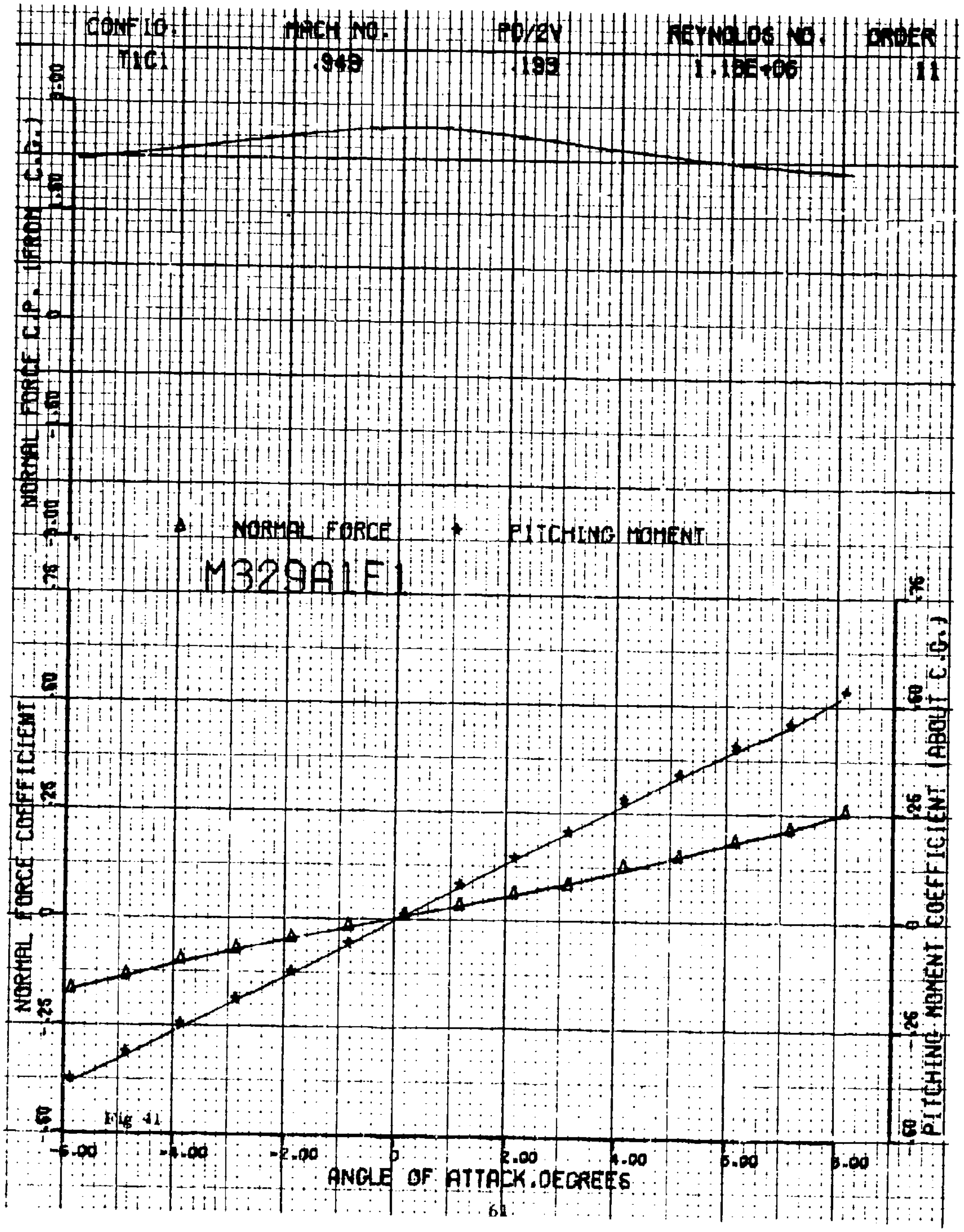

CONFIG.
T1C1
MACH NO.
.949
PD/2V
.193
REYNOLDS NO.
1.18E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-4.00
-2.00
0
2.00
4.00
6.00
8.00
ANGLE OF ATTACK, DEGREES

Fig 41

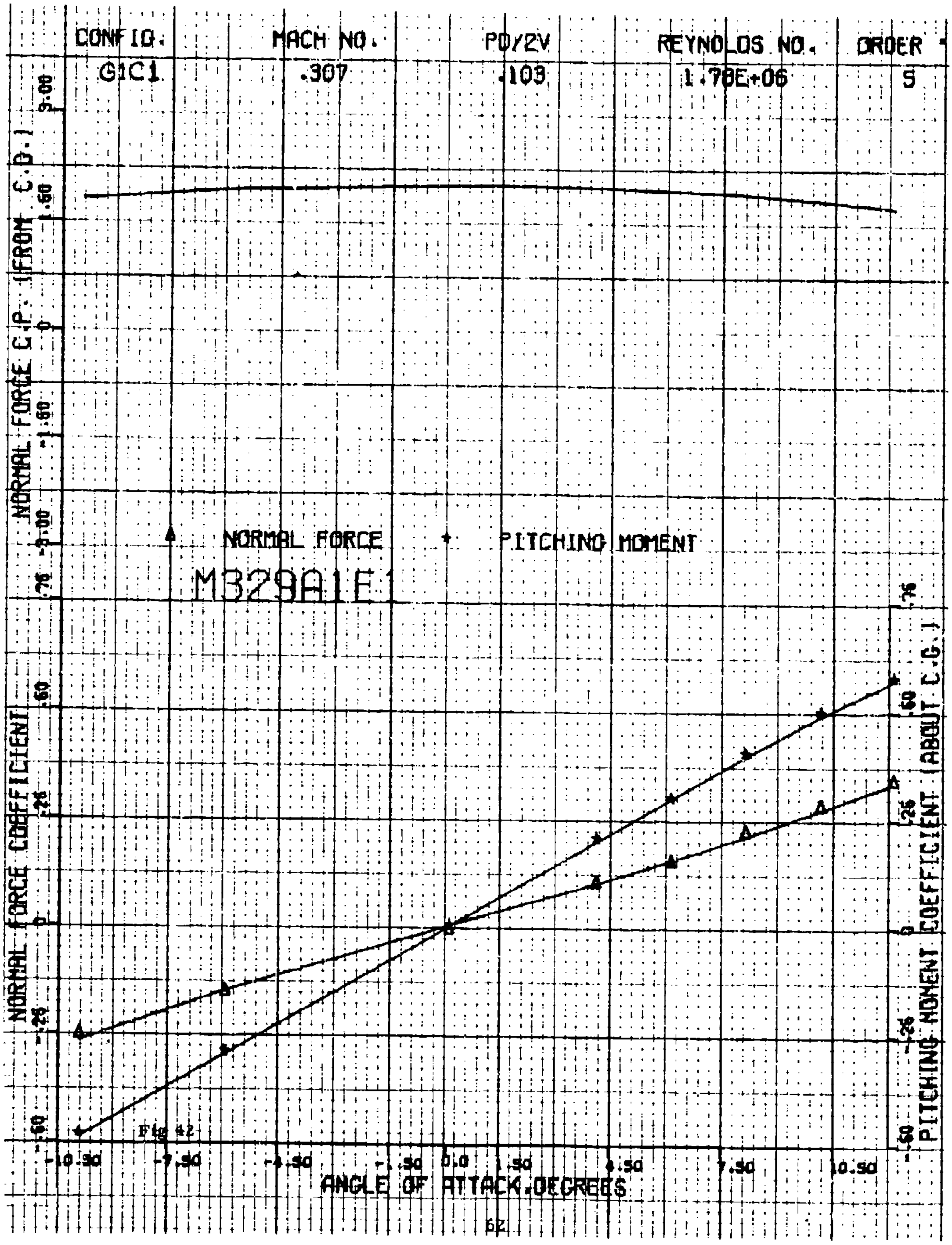
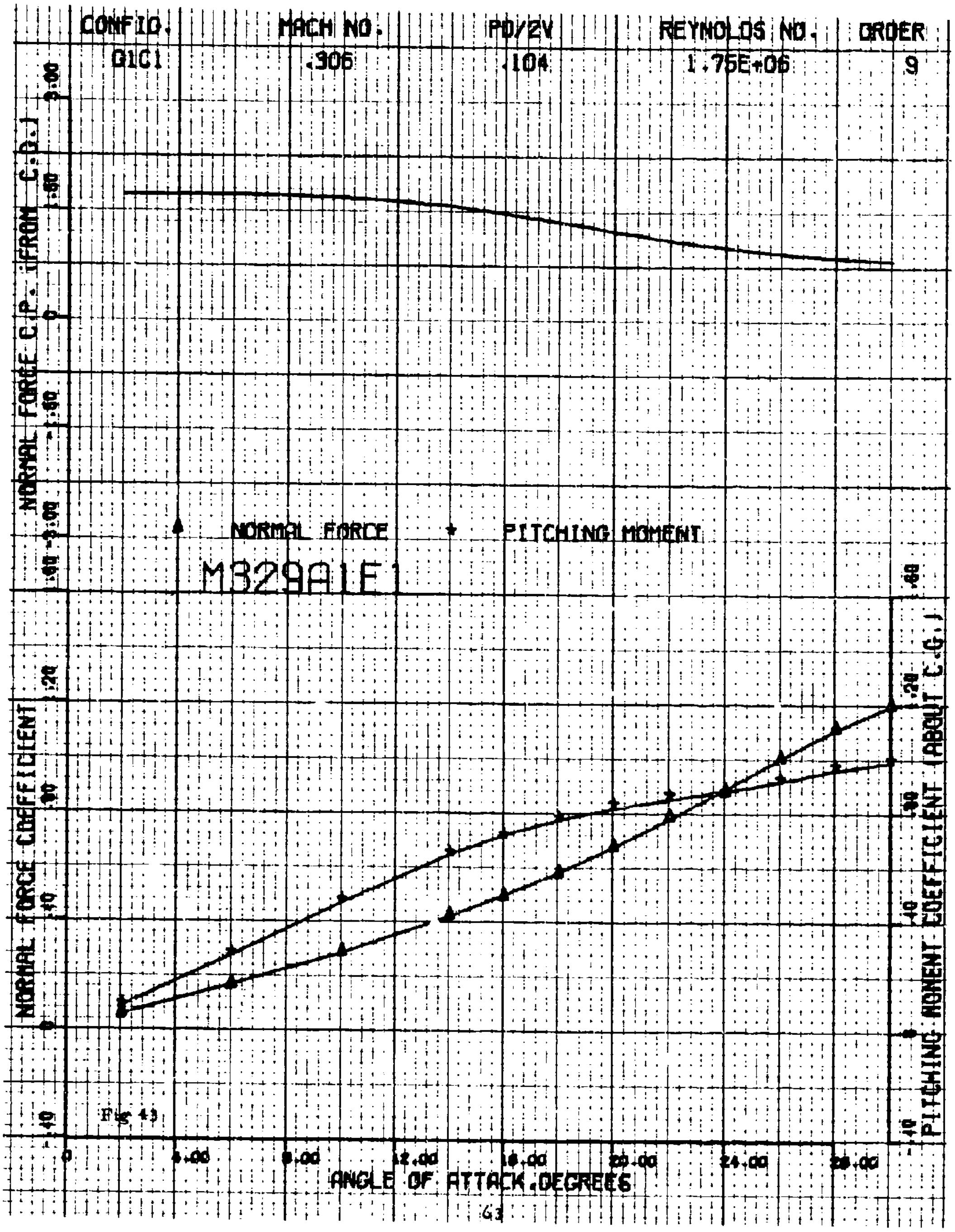
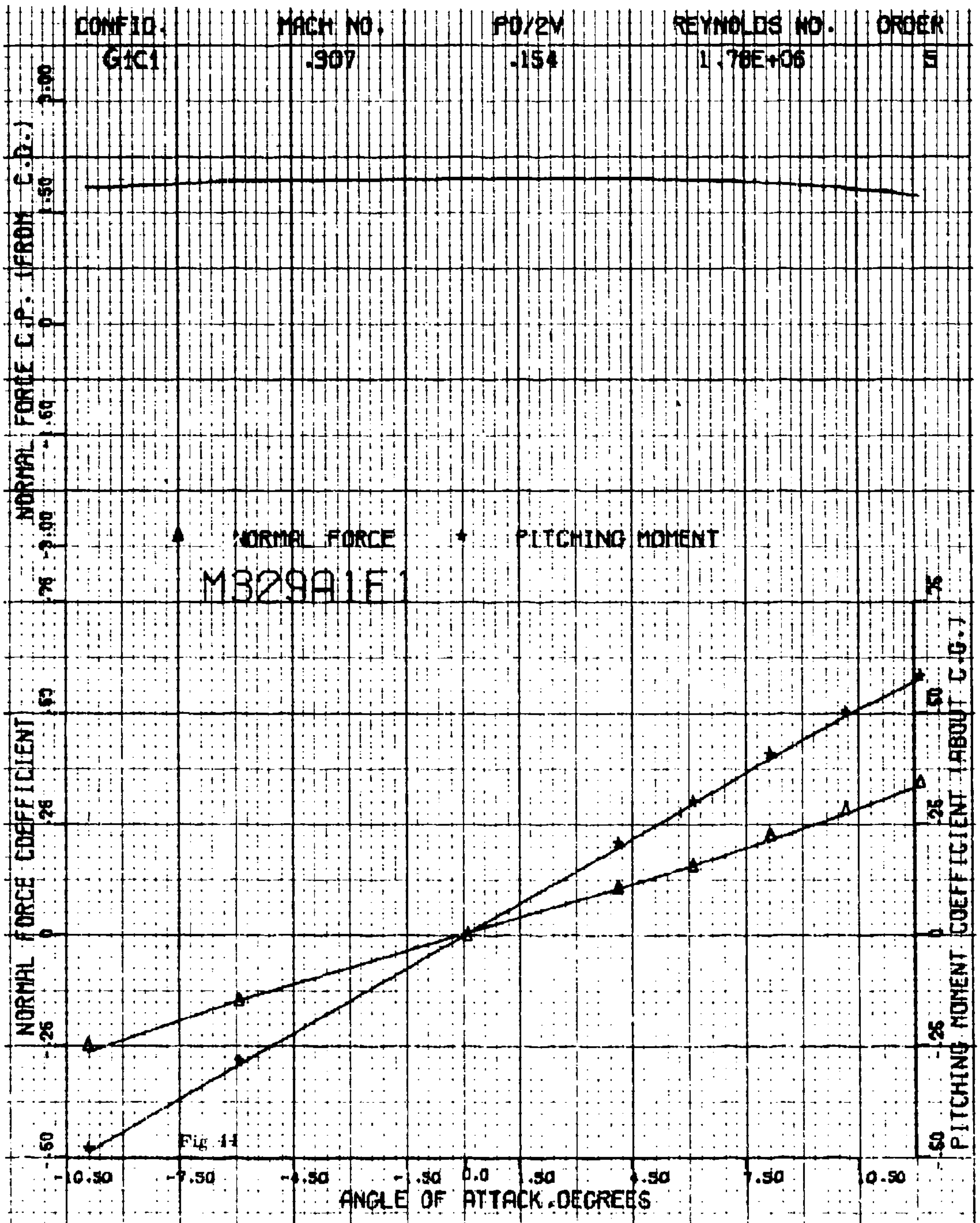

CONFIG.
G1C1
MACH NO.
.307
PD/2V
.103
REYNOLDS NO.
1.78E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-10.50
-7.50
-4.50
-1.50
0.0
1.50
4.50
7.50
10.50

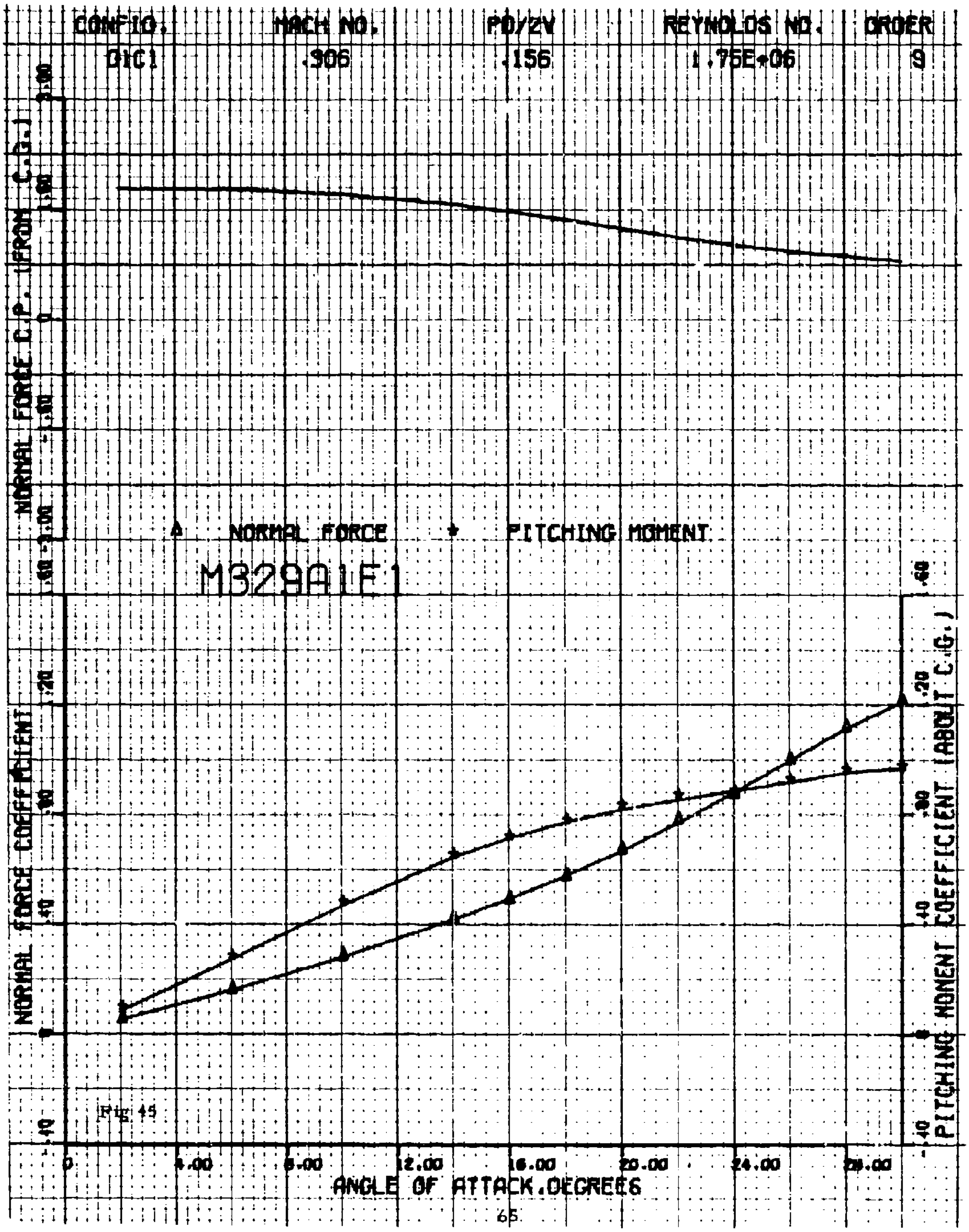
Fig 42


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
G1C1
.306
.104
1.75E+06
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329ALE1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 43
ANGLE OF ATTACK,DEGREES



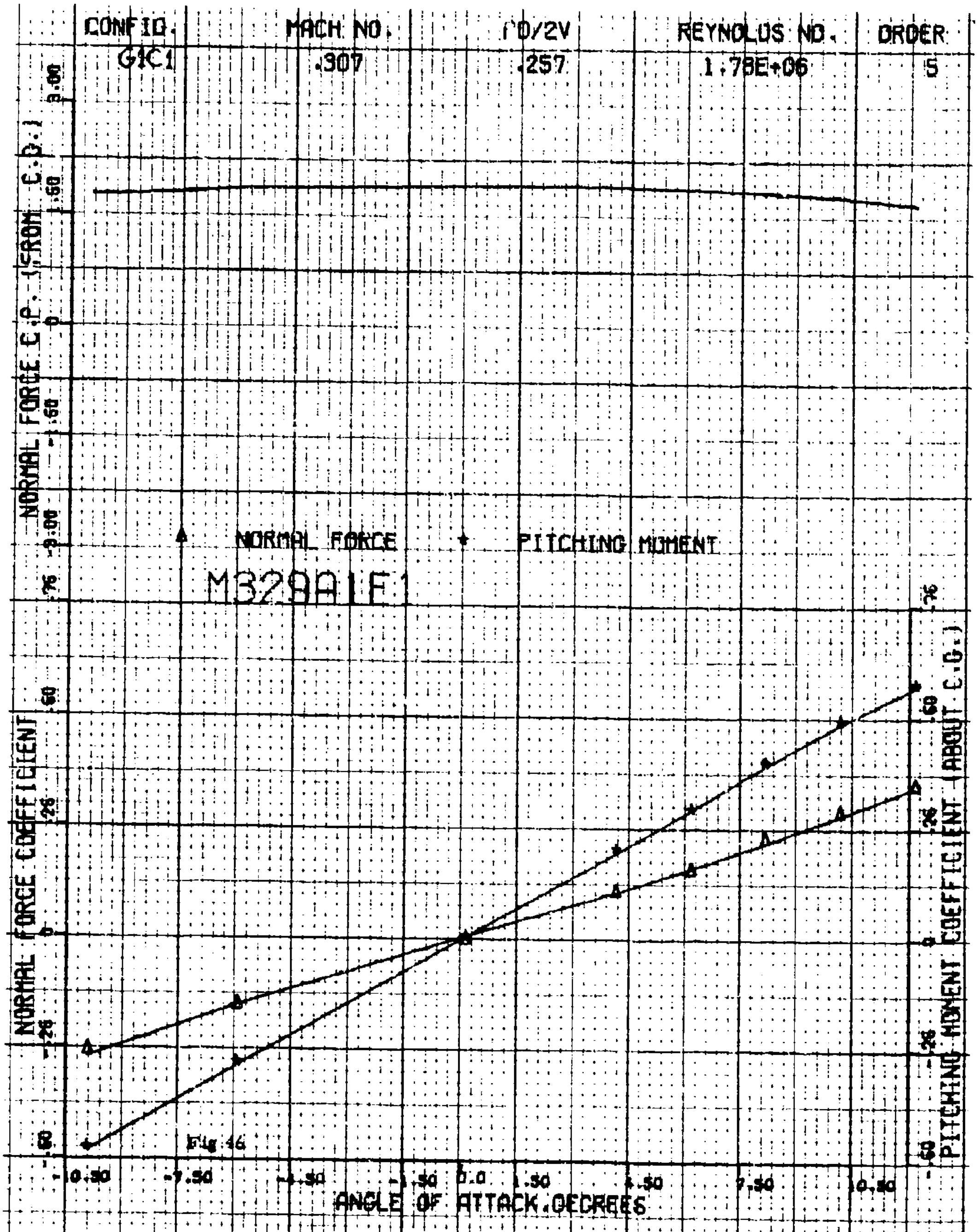
CONFIG.
G1C1
MACH NO.
.307
PD/2V
.154
REYNOLDS NO.
1.78E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 44



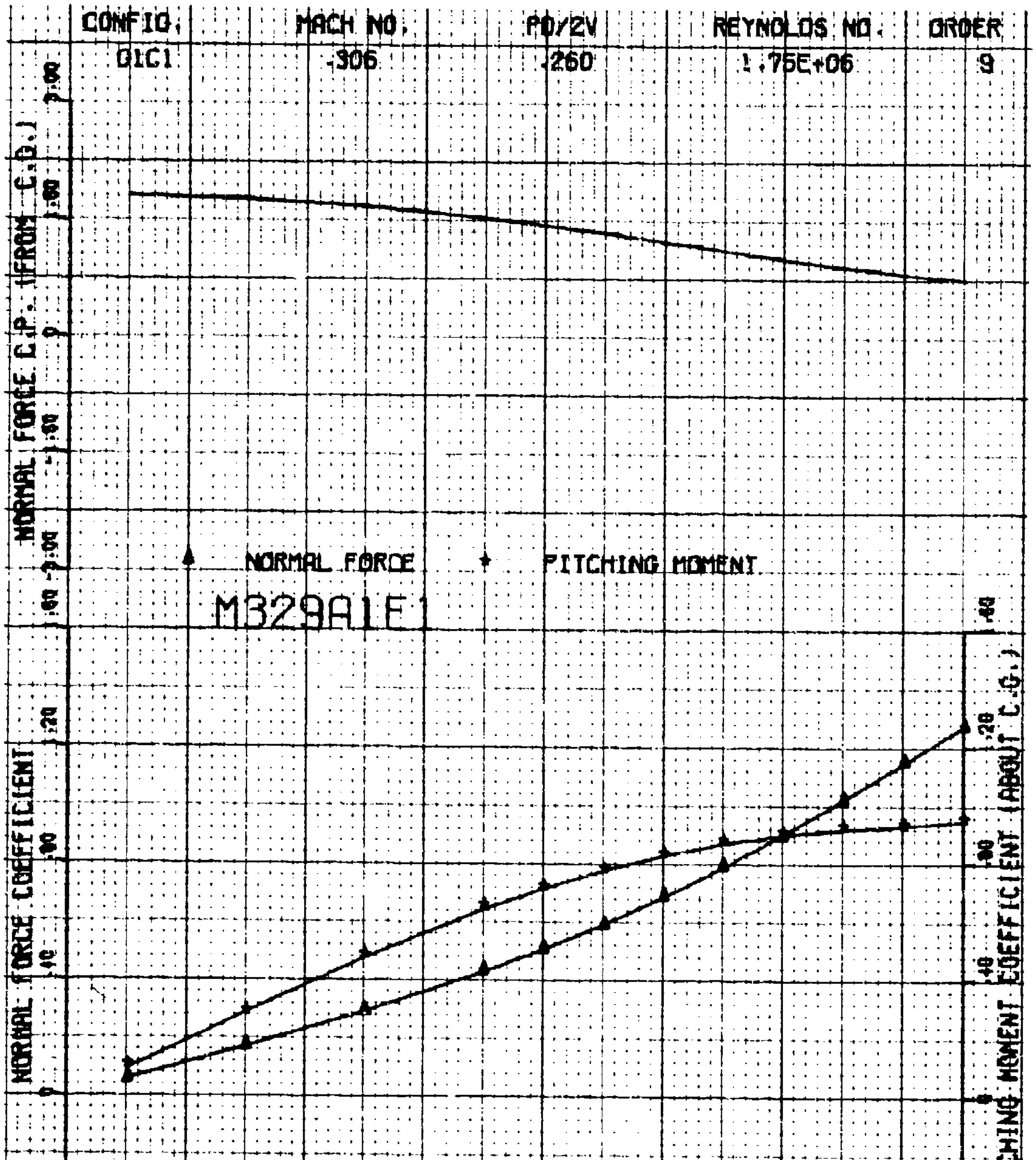
CONFIG.
D1C1
MACH NO.
.906
PD/2V
.156
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

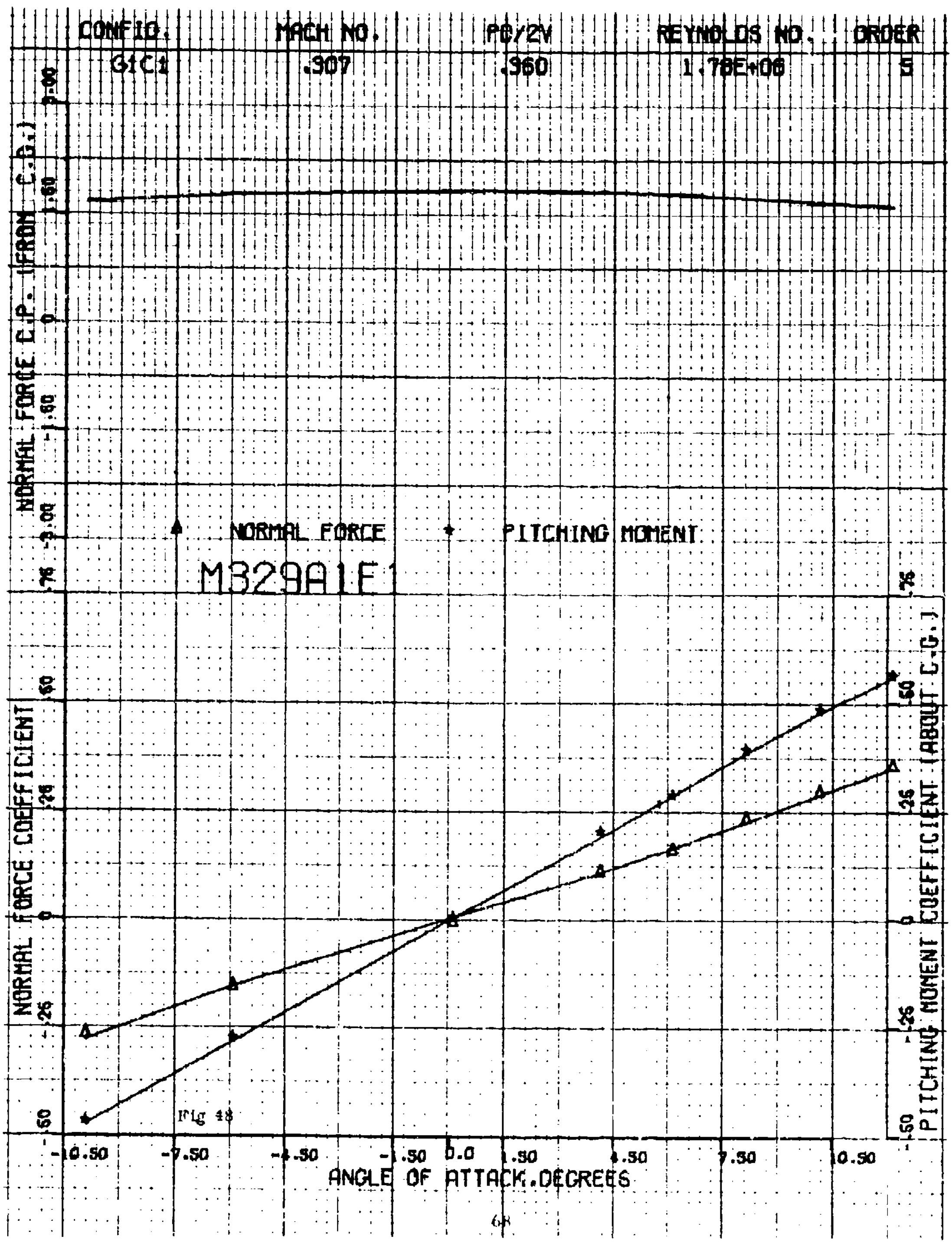
Fig 45

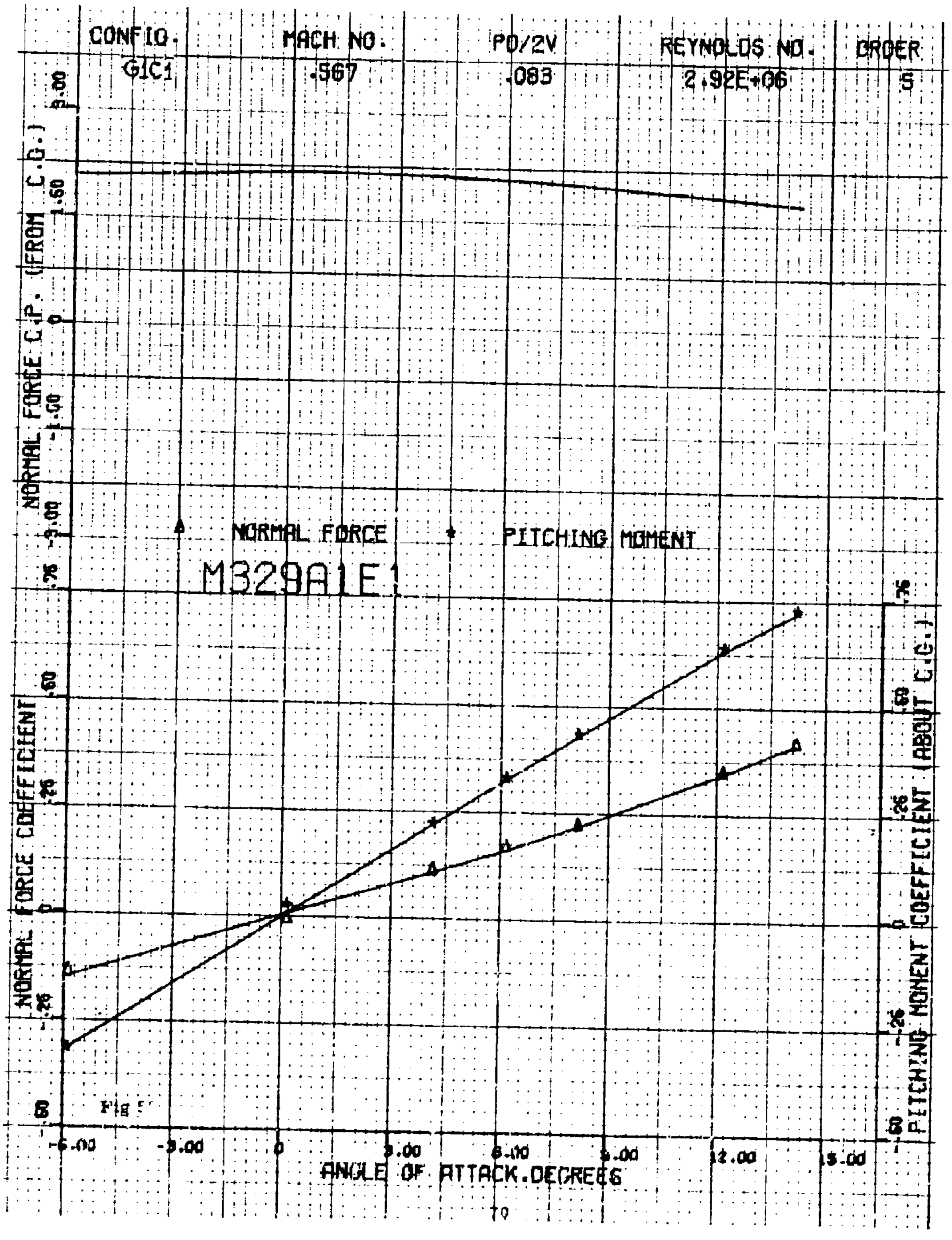


CONFIG.
G1C1
MACH NO.
.307
ΓD/2V
.257
REYNOLDS NO.
1.78E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-10.50
-7.50
-4.50
-1.50
0.0
1.50
4.50
7.50
10.50
ANGLE OF ATTACK, DEGREES

Fig 46

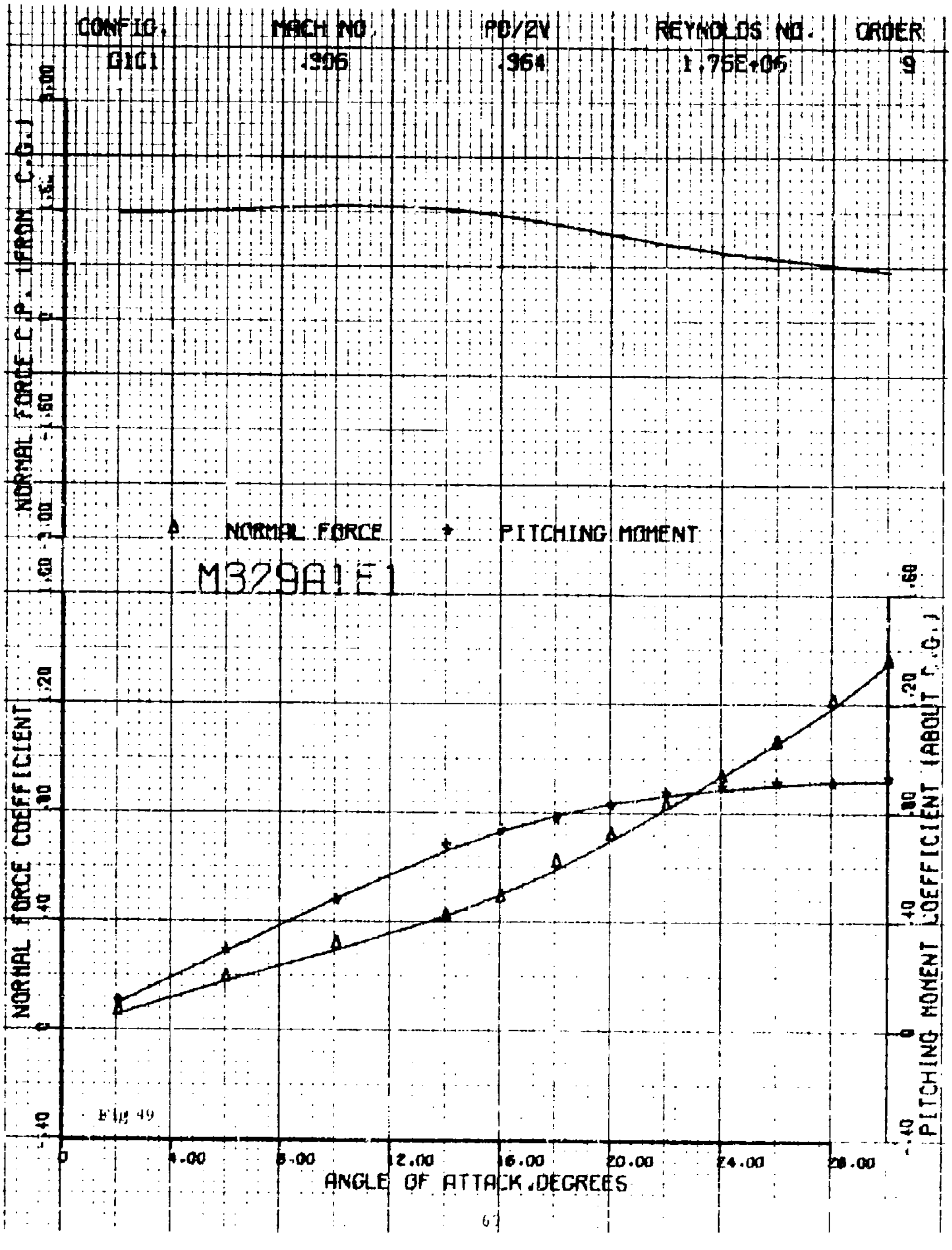

CONFIG.
D1C1
MACH NO.
.306
PD/2V
.260
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 47


CONFIG. G1C1
MACH NO. .307
PD/2V .360
REYNOLDS NO. 1.78E+06
ORDER 5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 48



CONFIG.
G1C1
MACH NO.
.567
PD/2V
.083
REYNOLDS NO.
2.92E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00

Fig 5



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
G1C1
.906
.364
1.75E+06
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00

Fig 49

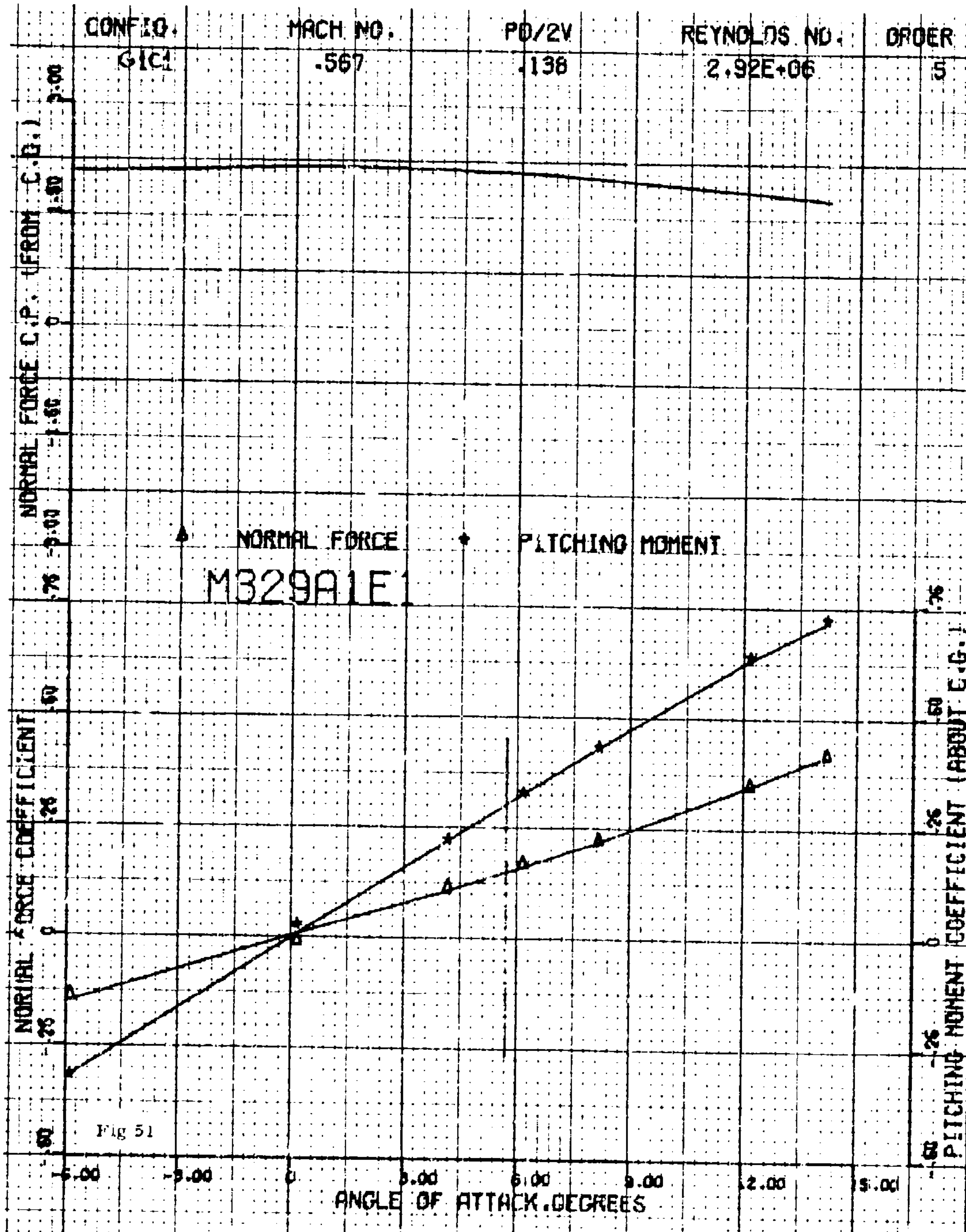
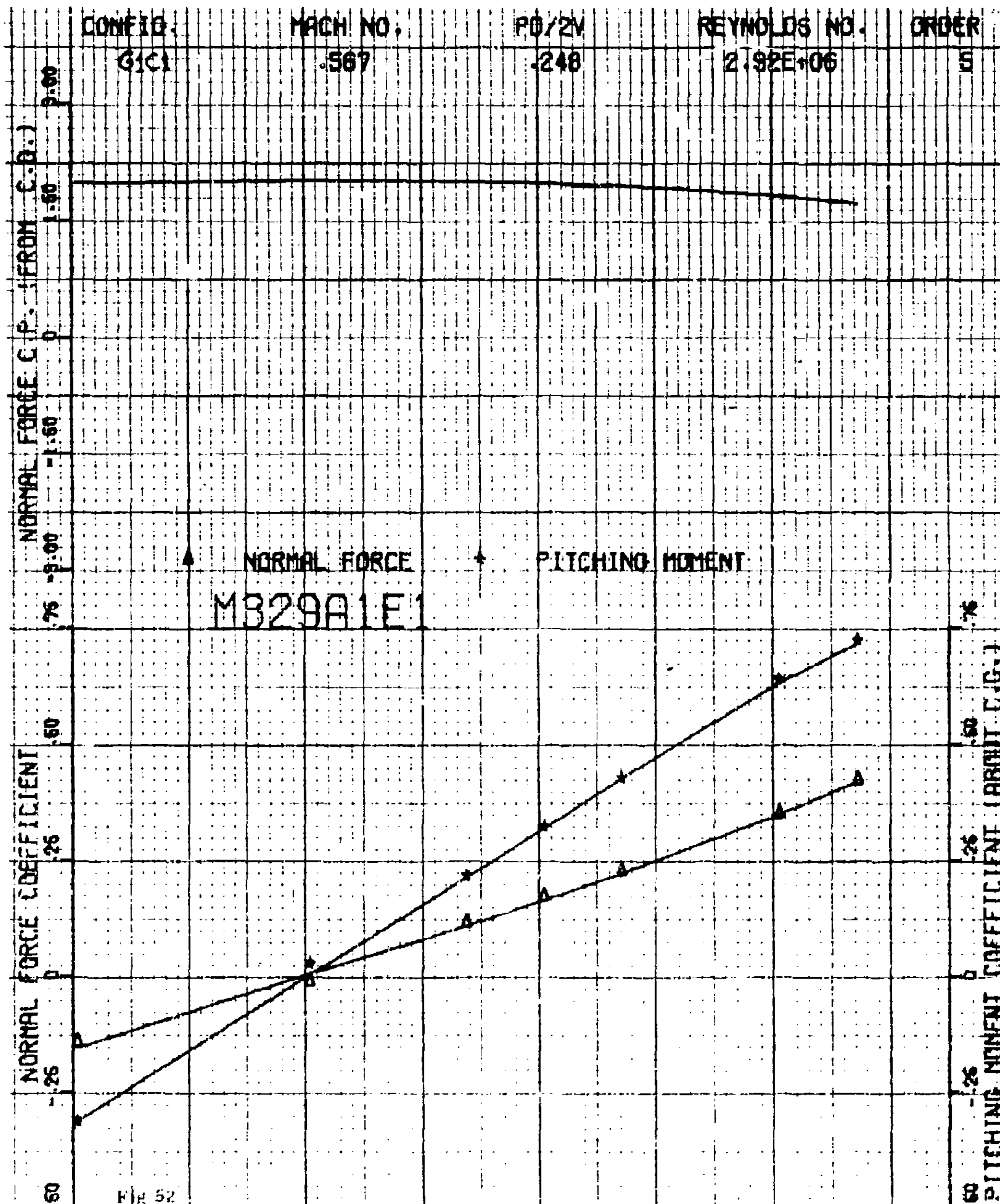

CONFIG.
GIC1
MACH NO.
.567
PD/2V
.138
REYNOLDS NO.
2.92E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 51



CONFIG. G1C1
MACH NO. .567
PD/2V .248
REYNOLDS NO. 2.92E+06
ORDER 5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 52

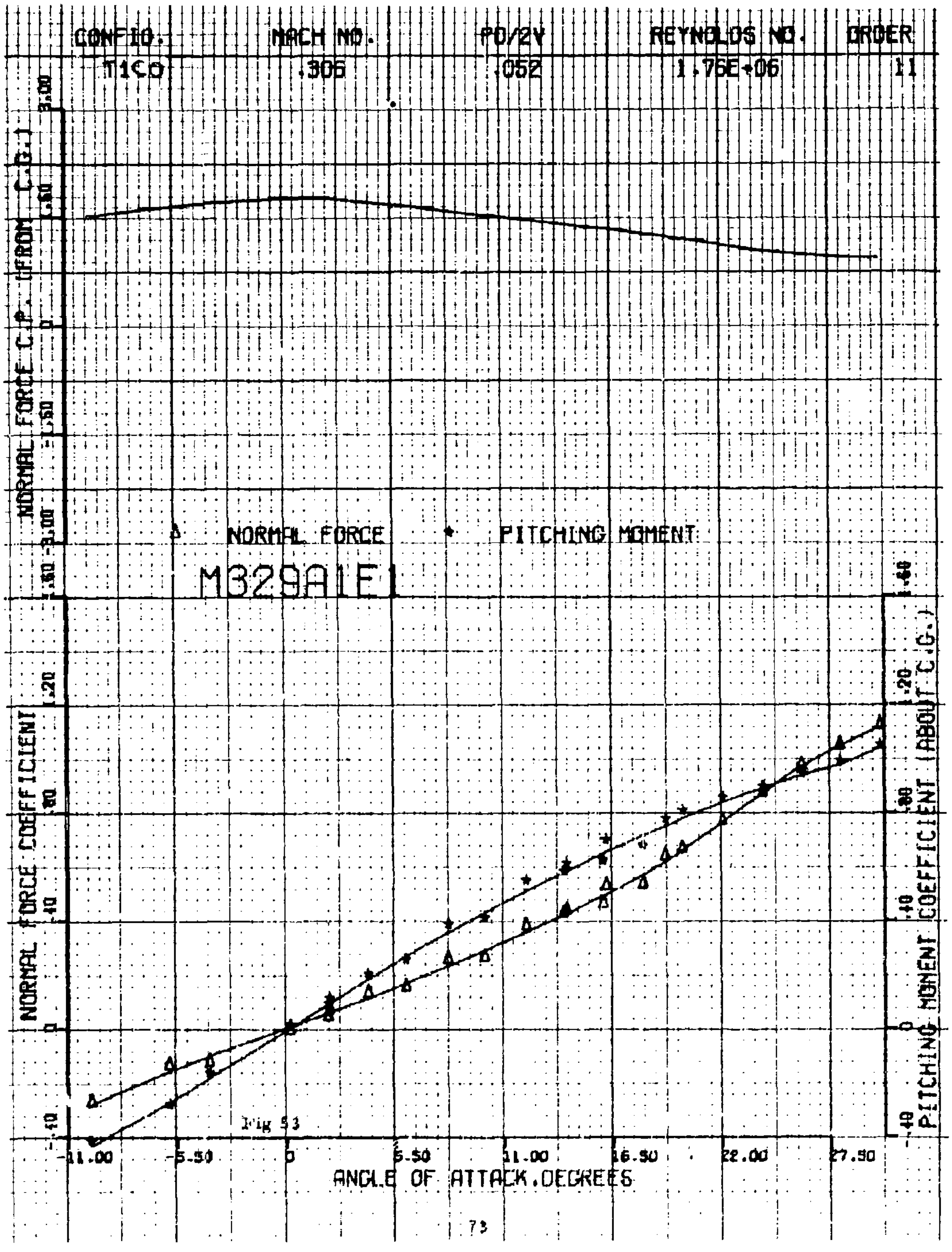
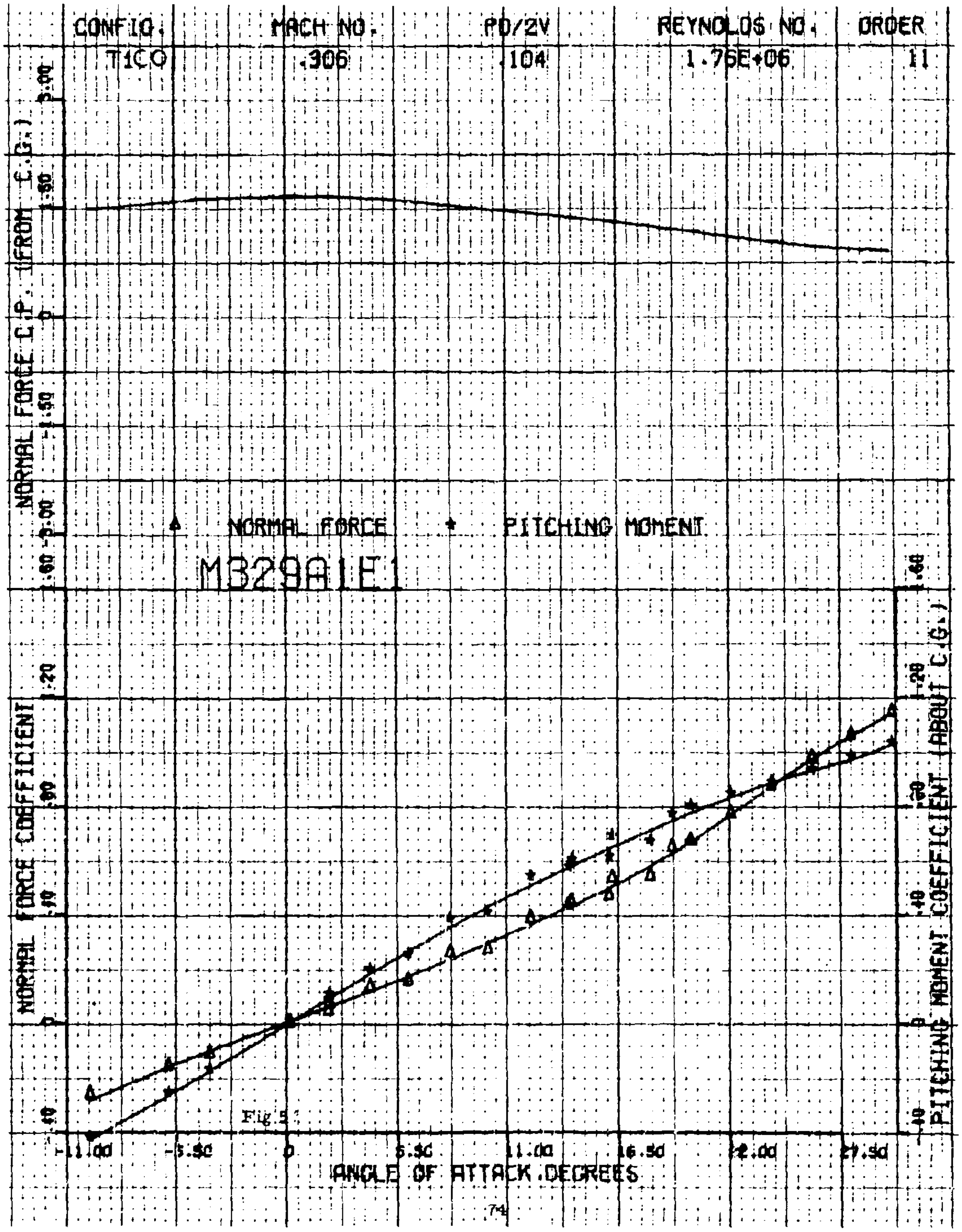
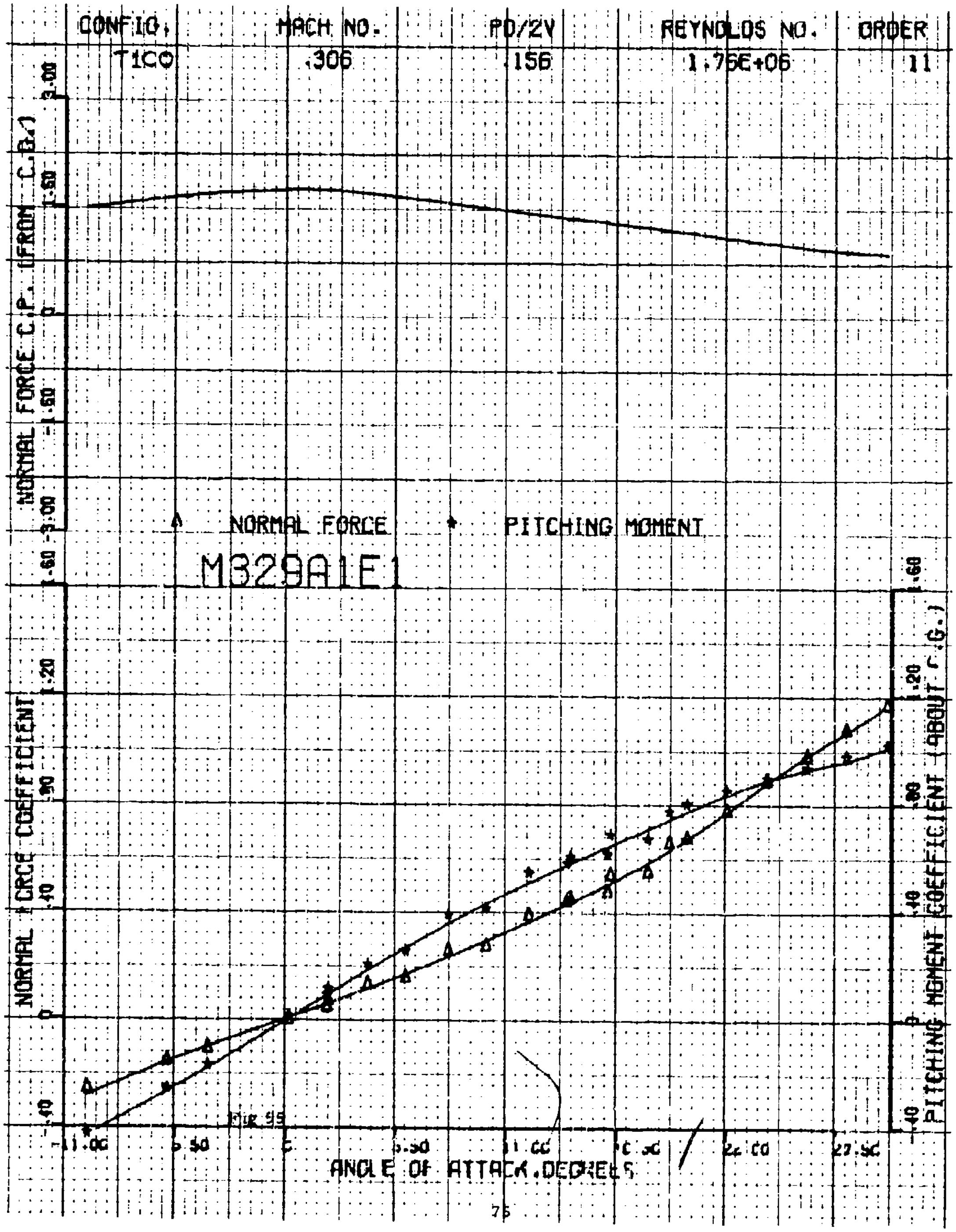

CONFIG.
T1C0
MACH NO.
.306
PD/2V
.052
REYNOLDS NO.
1.76E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
1.60
1.20
.80
.40
0
-.40
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
ANGLE OF ATTACK, DEGREES

Fig 53



CONFIG.
T1C0
MACH NO.
.306
PD/2V
.104
REYNOLDS NO.
1.76E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 5



CONFIG.
T1CO
MACH NO.
.306
PD/2V
.156
REYNOLDS NO.
1.76E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.B.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
1.60
1.20
.80
.40
0
-.40
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
ANGLE OF ATTACK, DEGREES
Fig 55

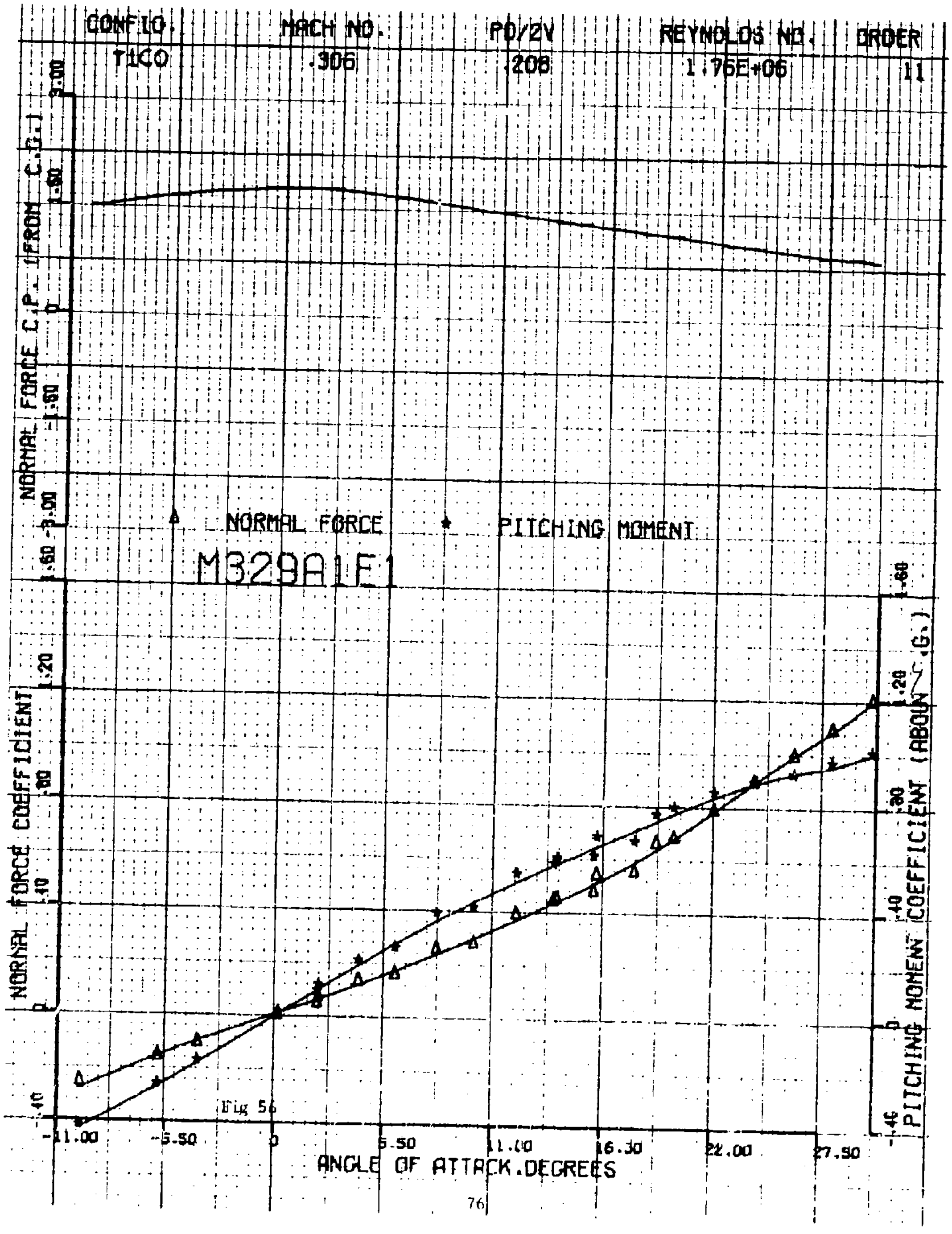
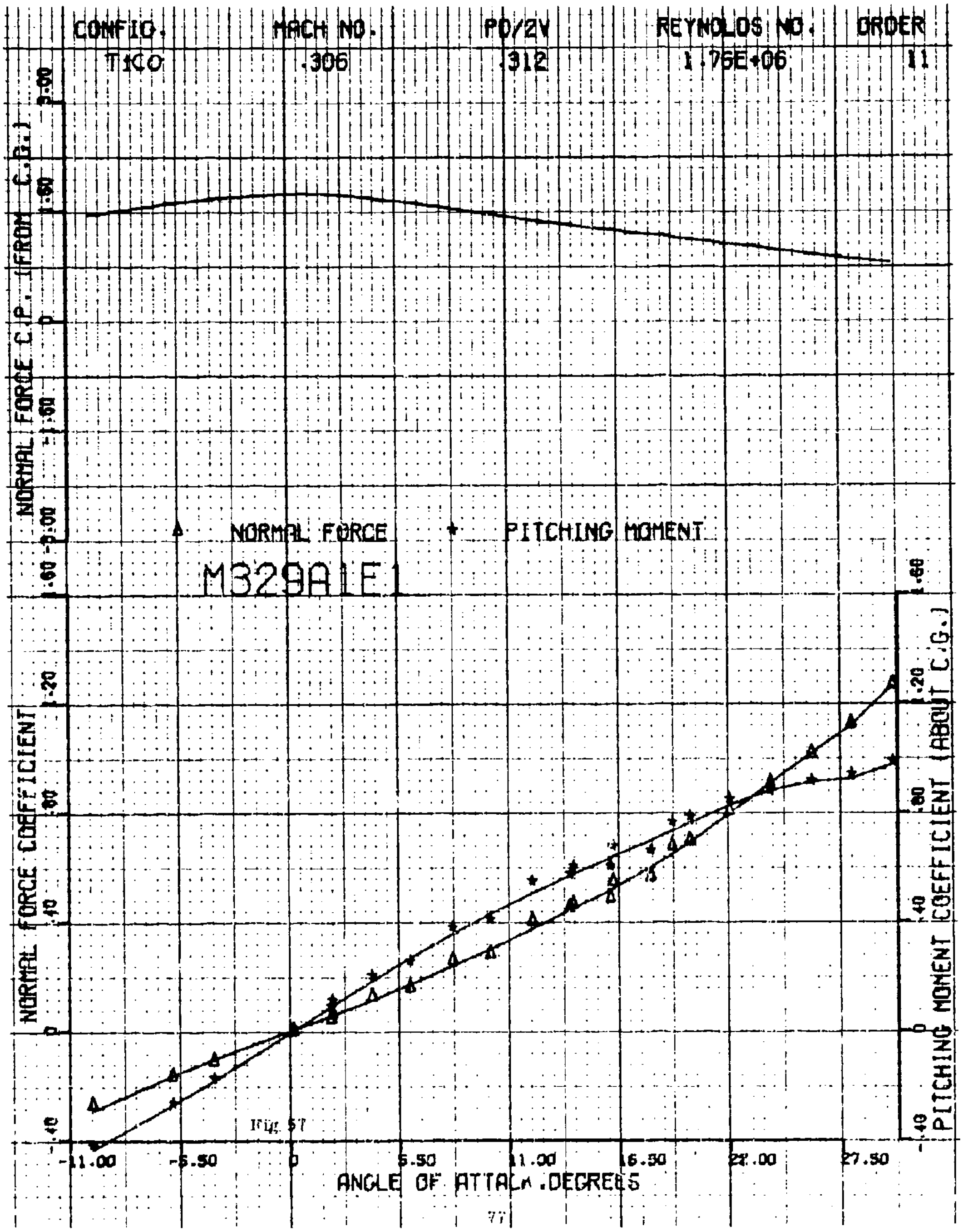
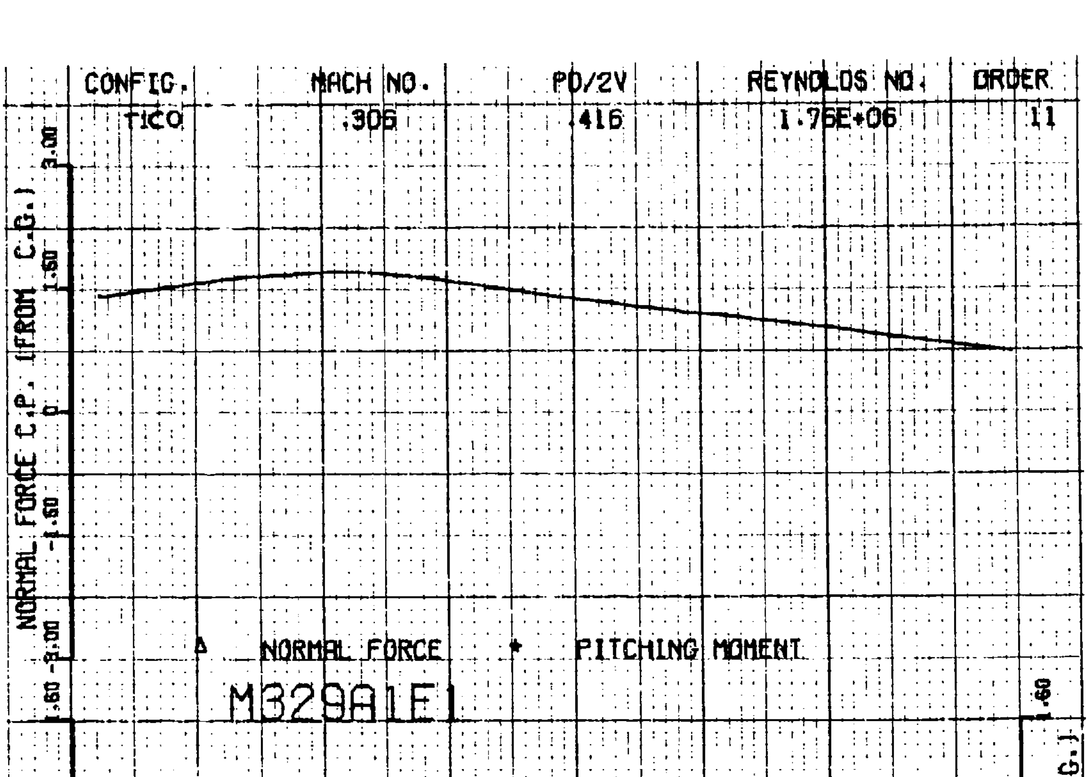

CONFIG.
T1CO
MACH NO.
.306
PD/2V
.208
REYNOLDS NO.
1.76E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK.DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

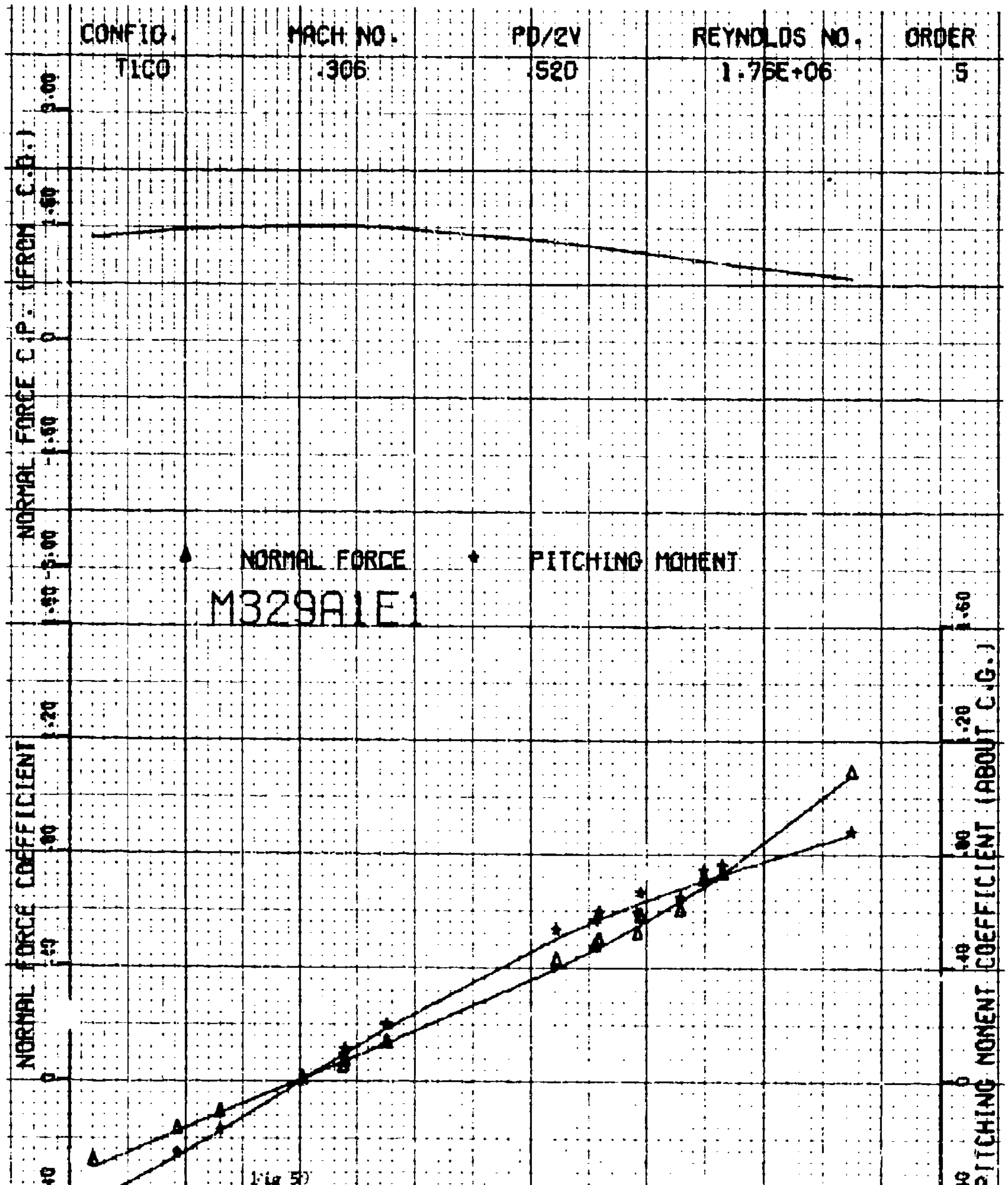
Fig 56

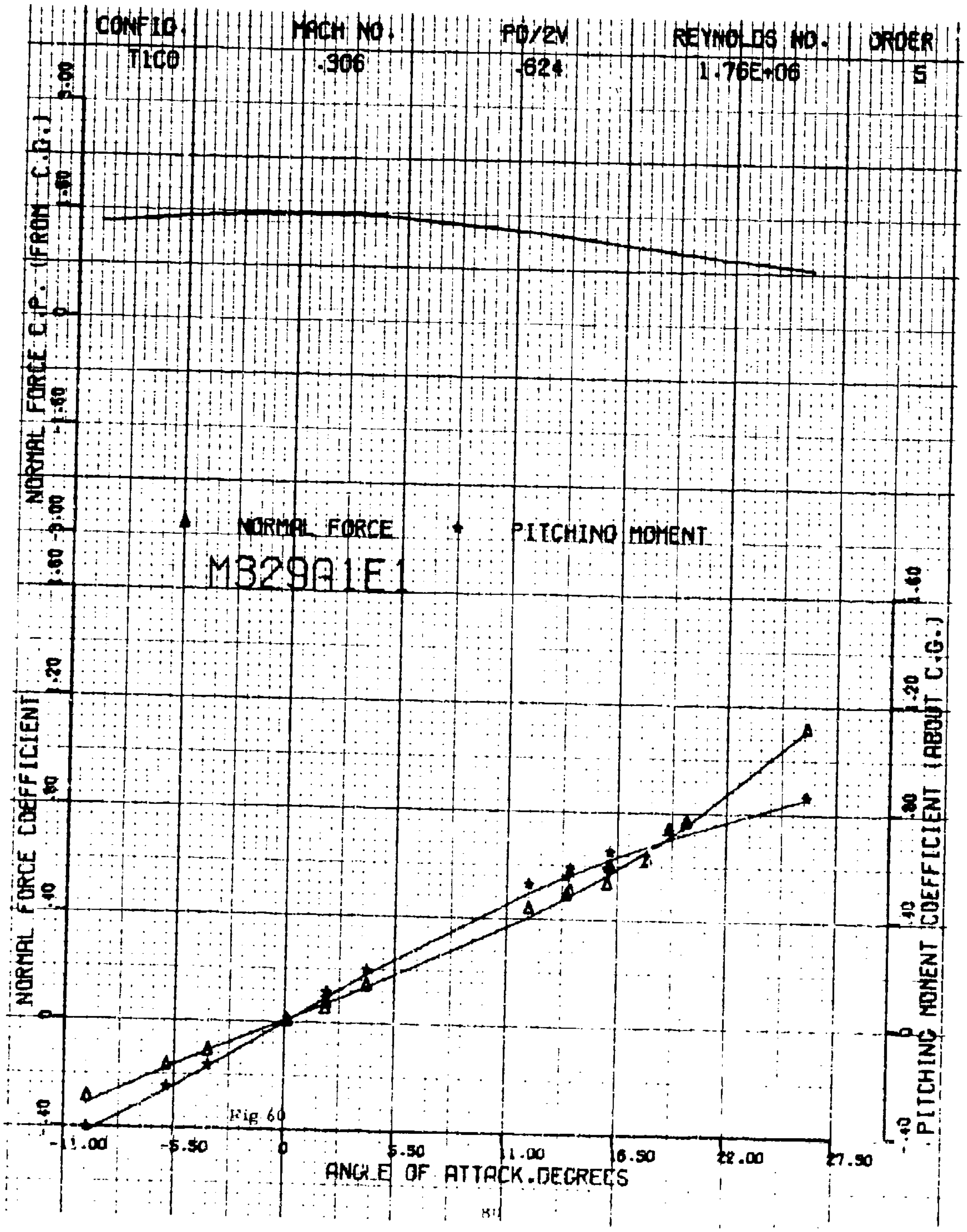


CONFIG.
T1C0
MACH NO.
.306
PD/2V
.312
REYNOLDS NO.
1.75E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

Fig. 57

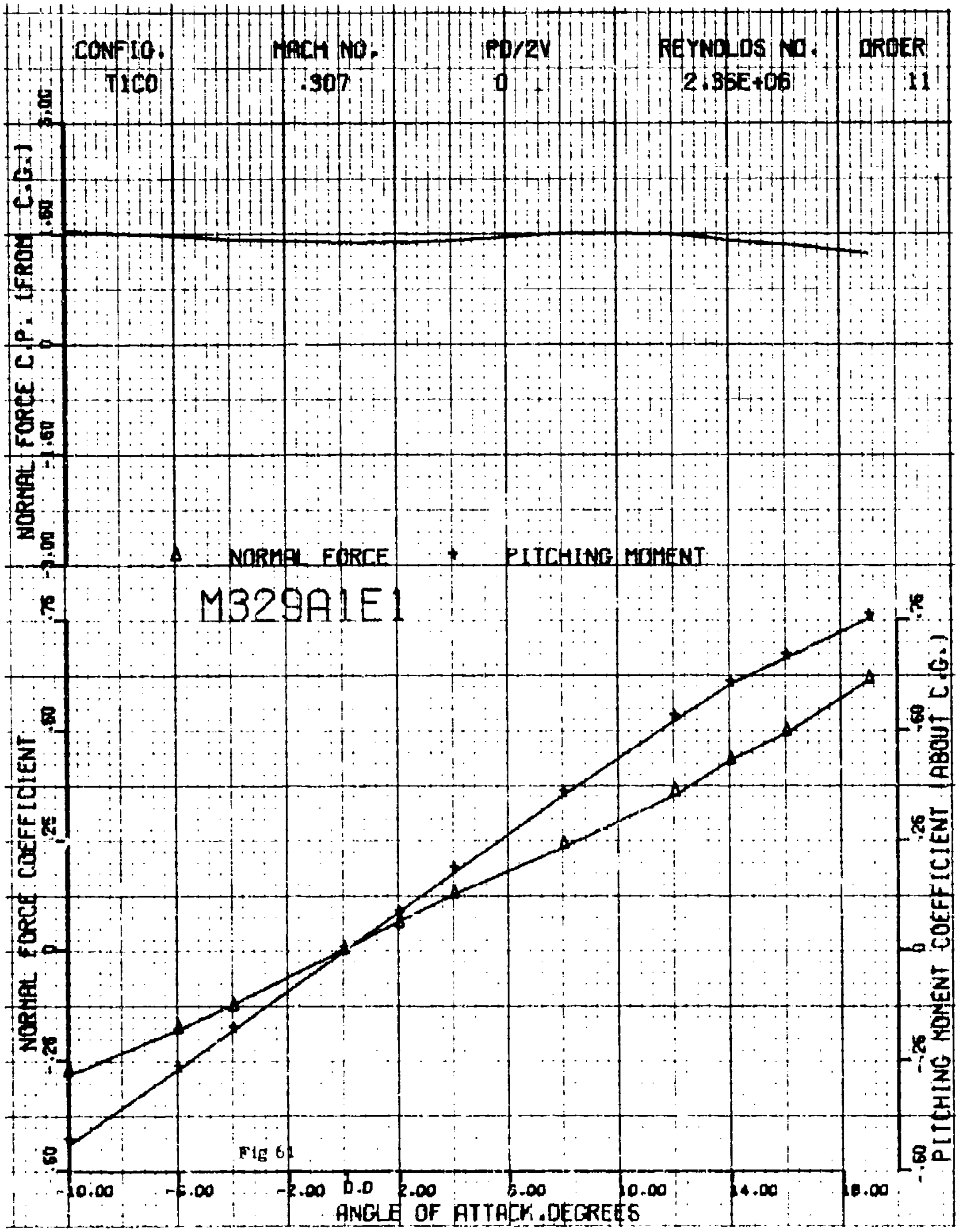

CONFIG.
TICO
MACH NO.
.306
PD/2V
.416
REYNOLDS NO.
1.76E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
1.60
1.20
.80
.40
0
-.40
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
ANGLE OF ATTACK,DEGREES
Fig 58


CONFIG.
T1CO
MACH NO.
.306
PD/2V
.520
REYNOLDS NO.
1.76E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
Fig 59

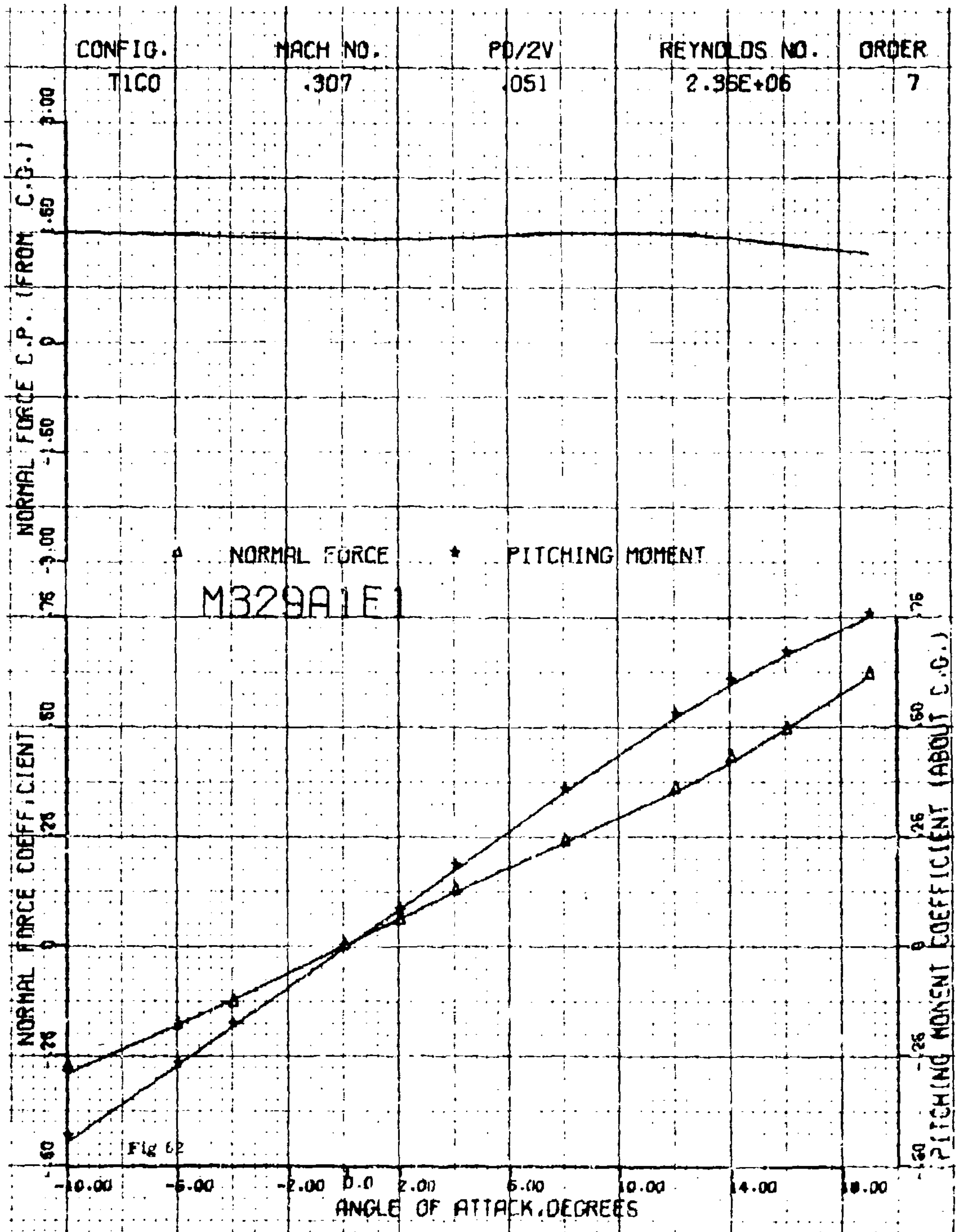


CONFIG.
T1C0
MACH NO.
.306
PD/2V
.624
REYNOLDS NO.
1.76E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 60



CONFIG.
TICO
MACH NO.
.307
PD/2V
0
REYNOLDS NO.
2.36E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 61
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00
ANGLE OF ATTACK, DEGREES



CONFIG.
T1C0
MACH NO.
.307
PD/2V
.051
REYNOLDS NO.
2.36E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFF,CIENT
.76
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00
ANGLE OF ATTACK,DEGREES
Fig 62

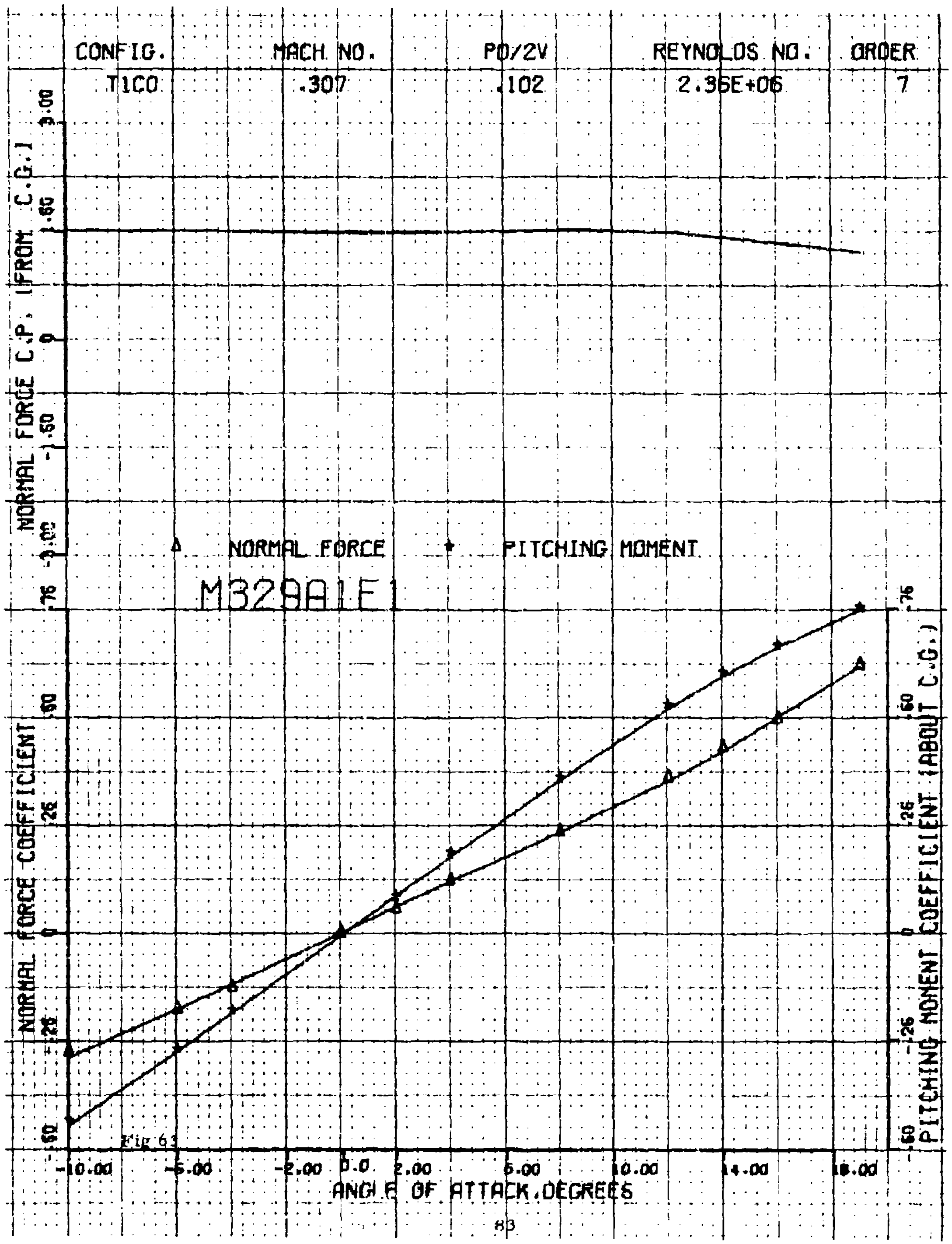
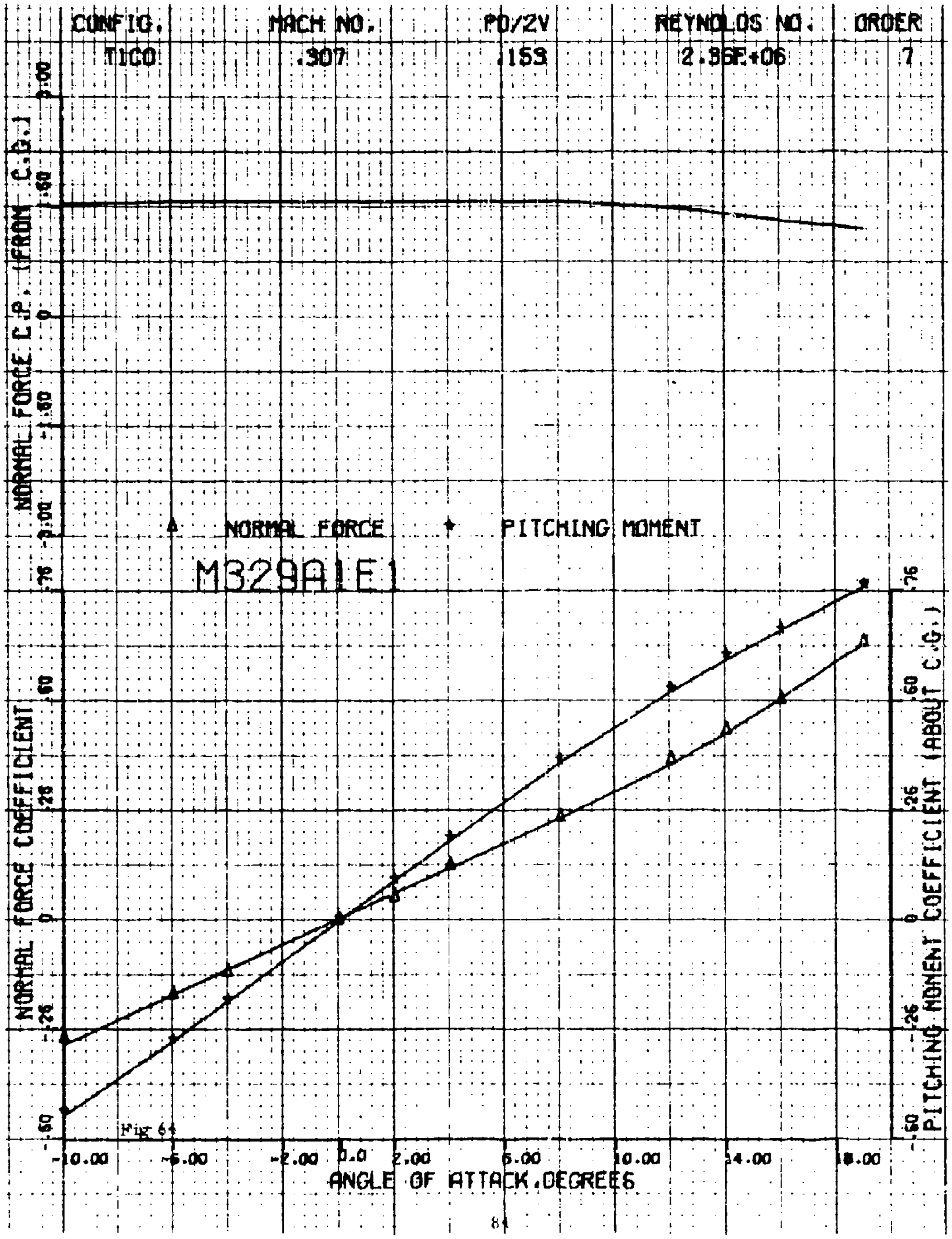
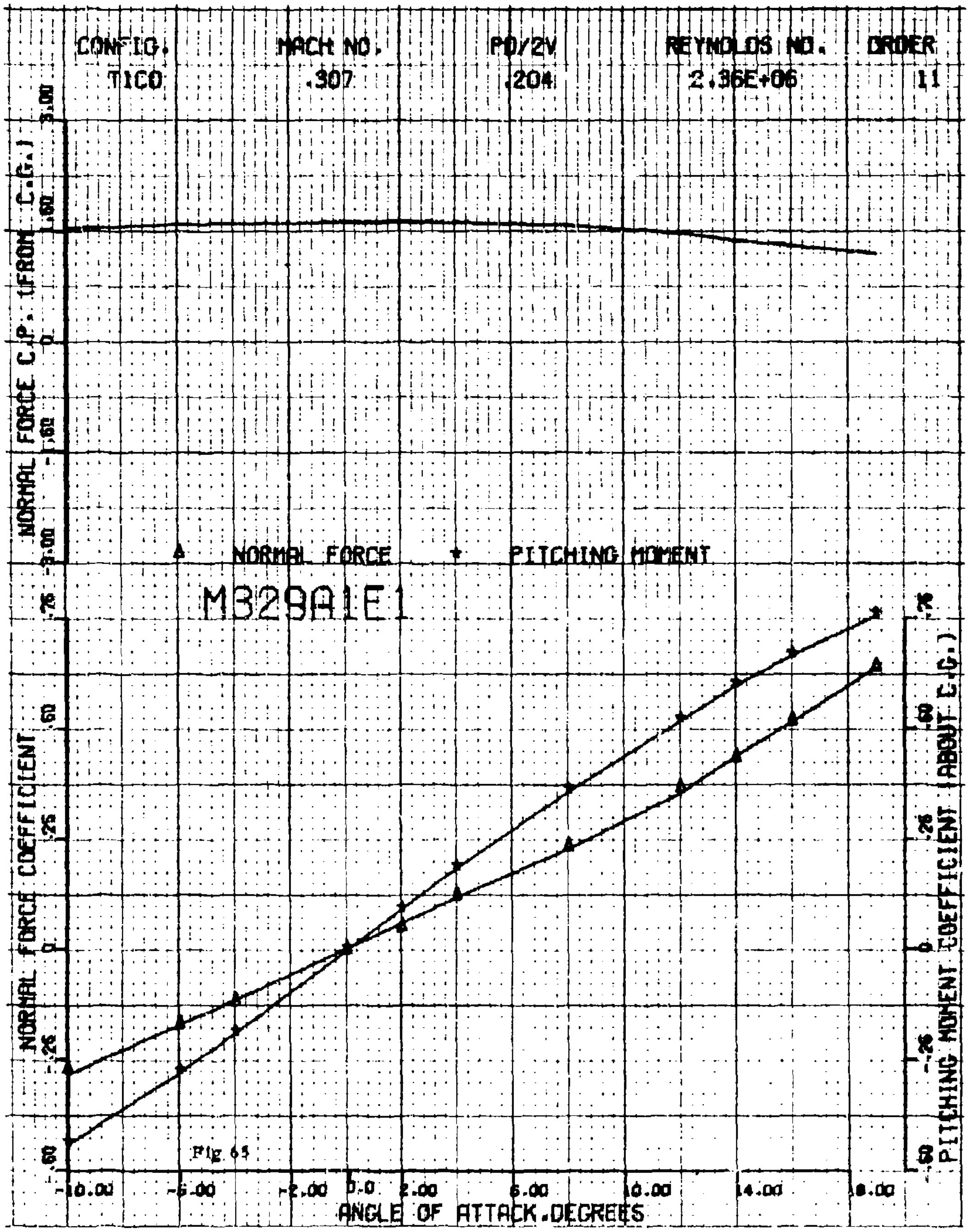

CONFIG.
T1CO
MACH NO.
.307
PD/2V
.102
REYNOLDS NO.
2.36E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.76
.50
.26
0
-.26
-.50
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00
ANGLE OF ATTACK,DEGREES

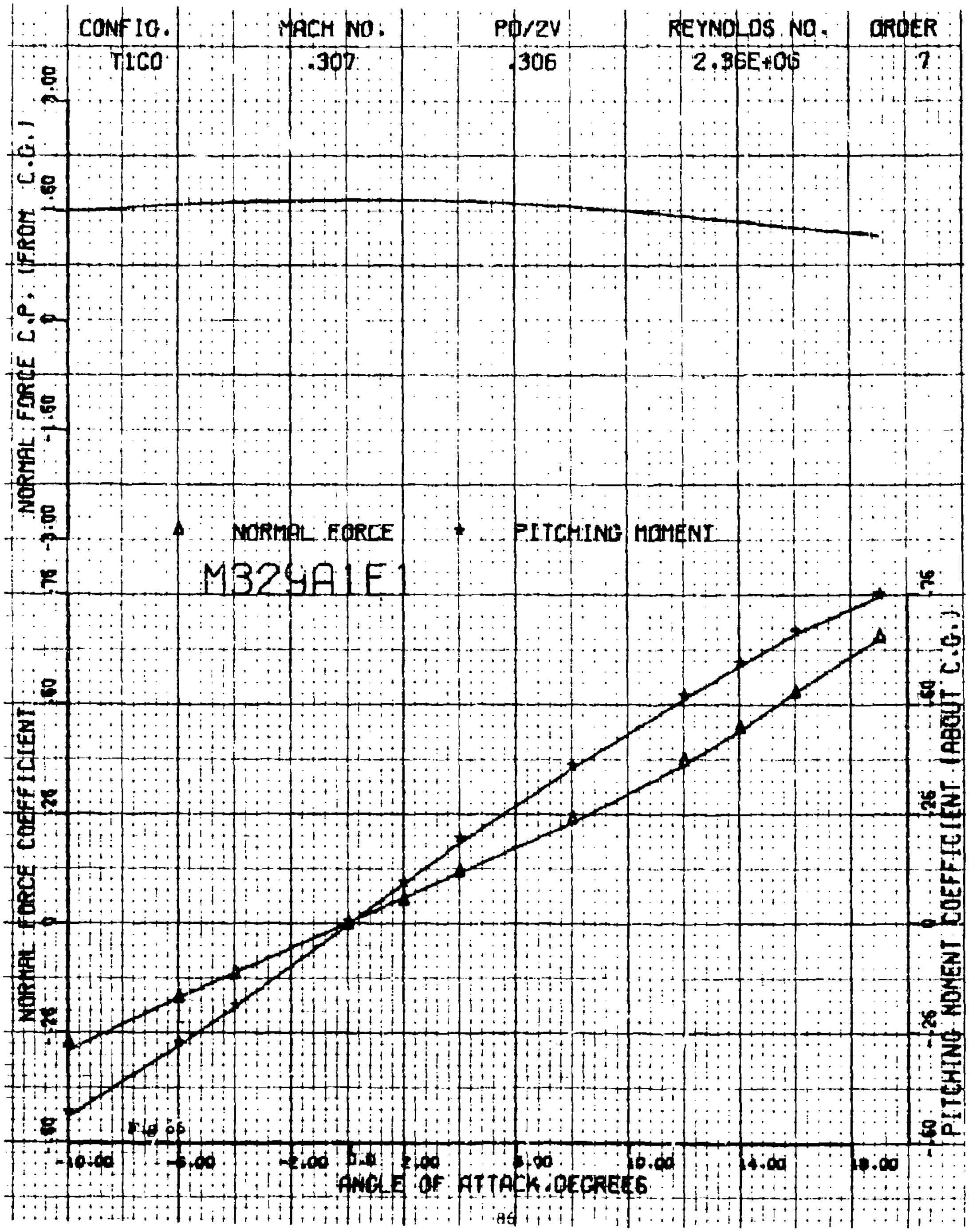
Fig 63

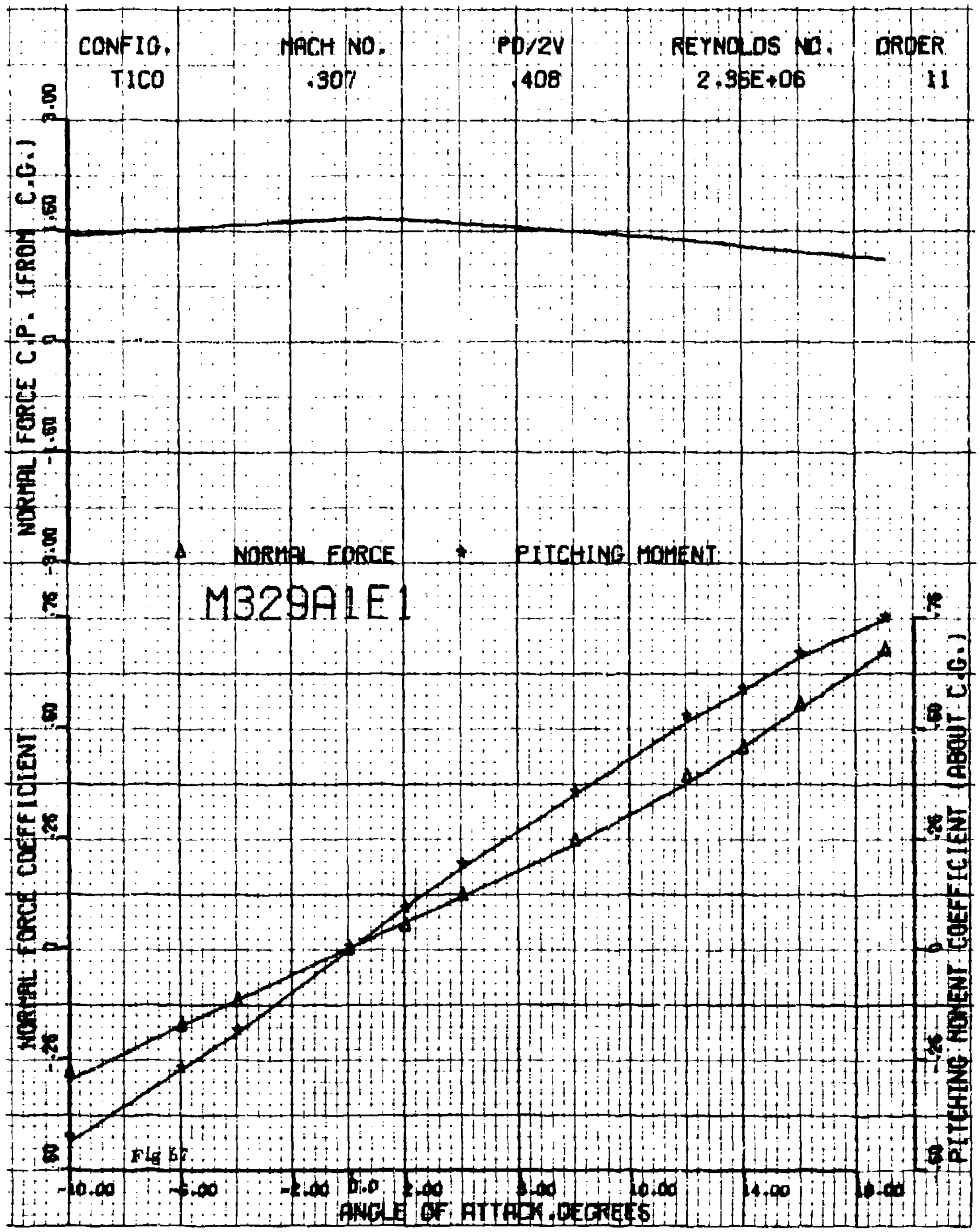


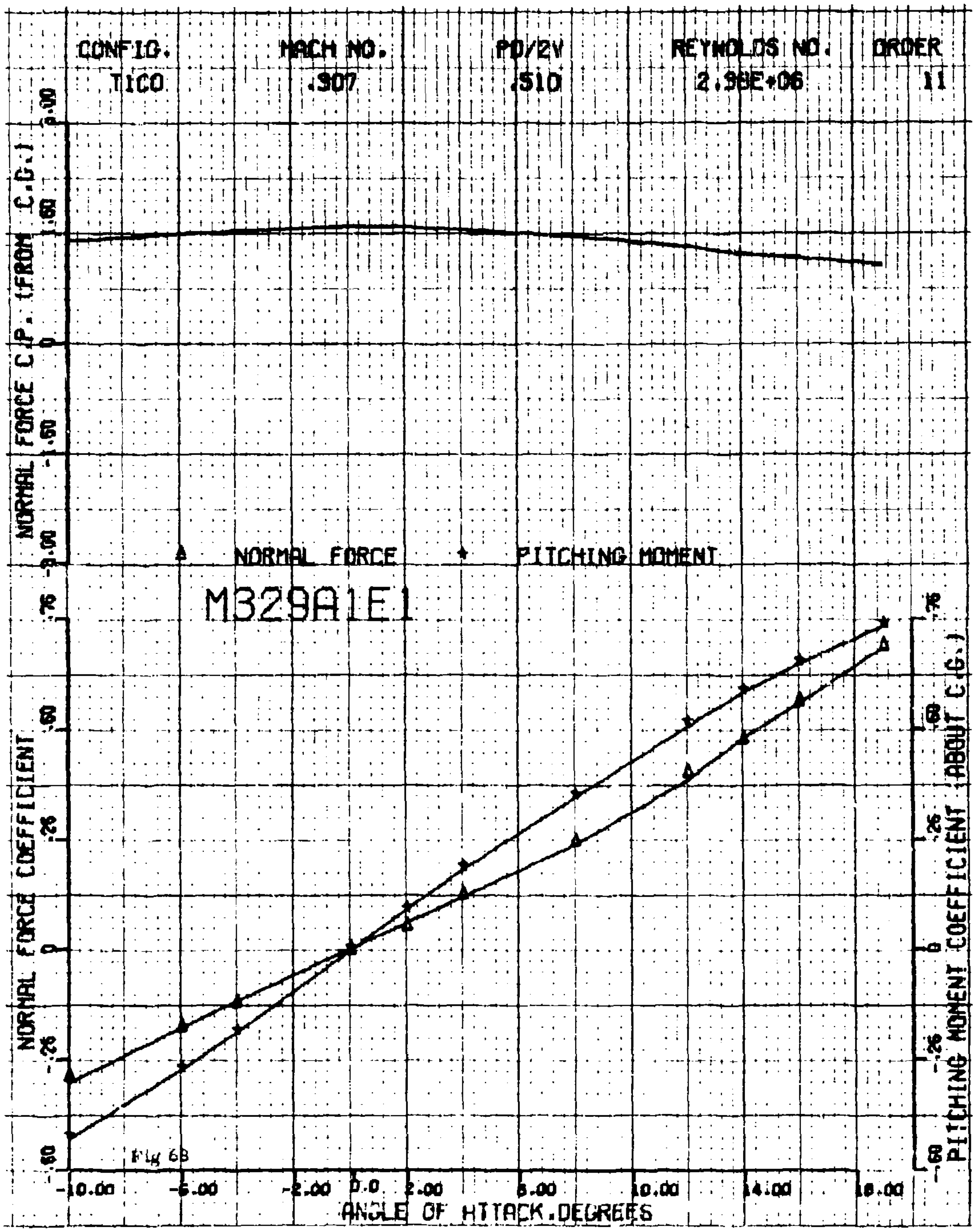
CONFIG.
TICO
MACH NO.
.307
PD/2V
.153
REYNOLDS NO.
2.36E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

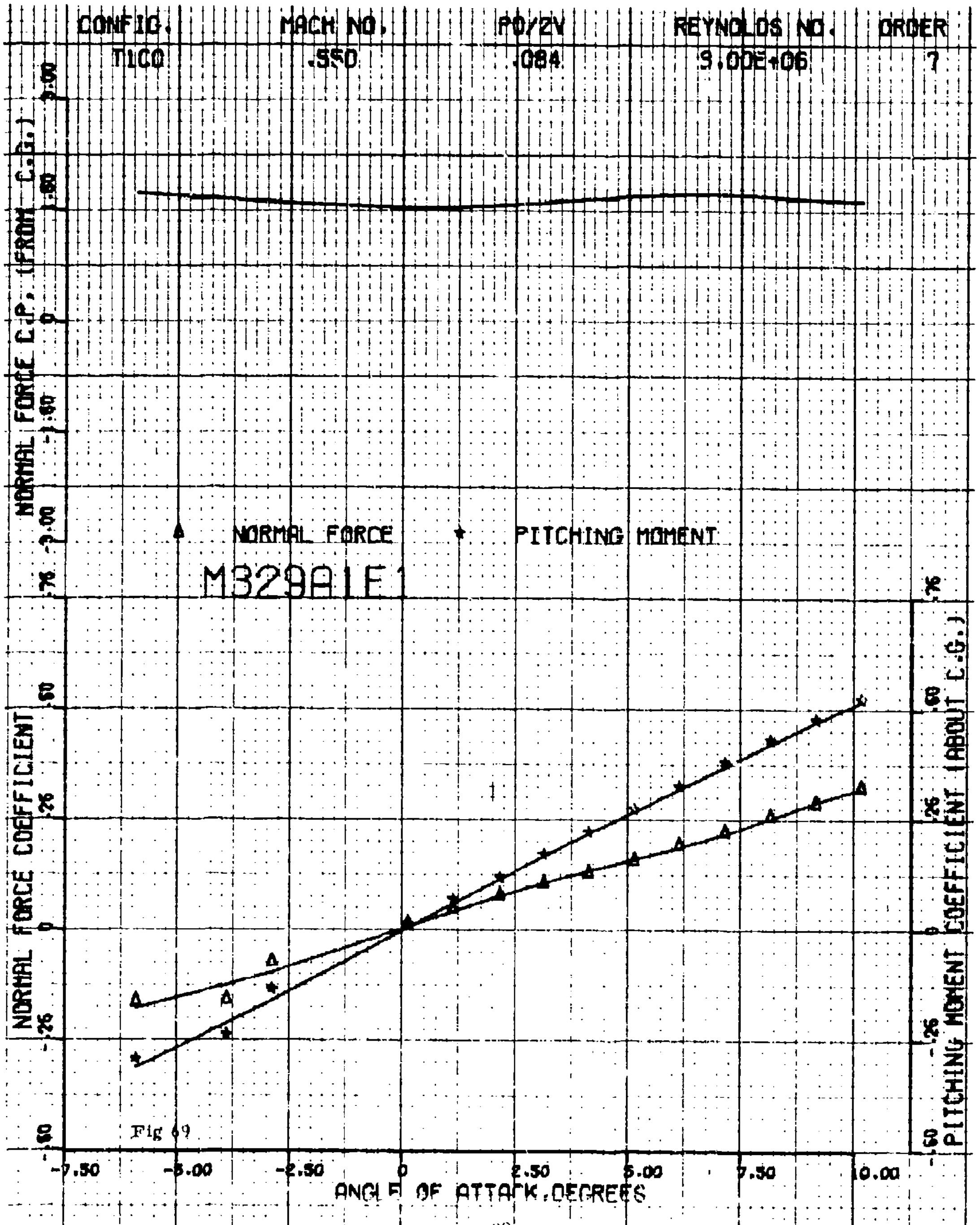
Fig 64


CONFIG.
T1C0
MACH NO.
.307
PD/2V
.204
REYNOLDS NO.
2.36E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig. 65


CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
TICO .307 .306 2.36E+06 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

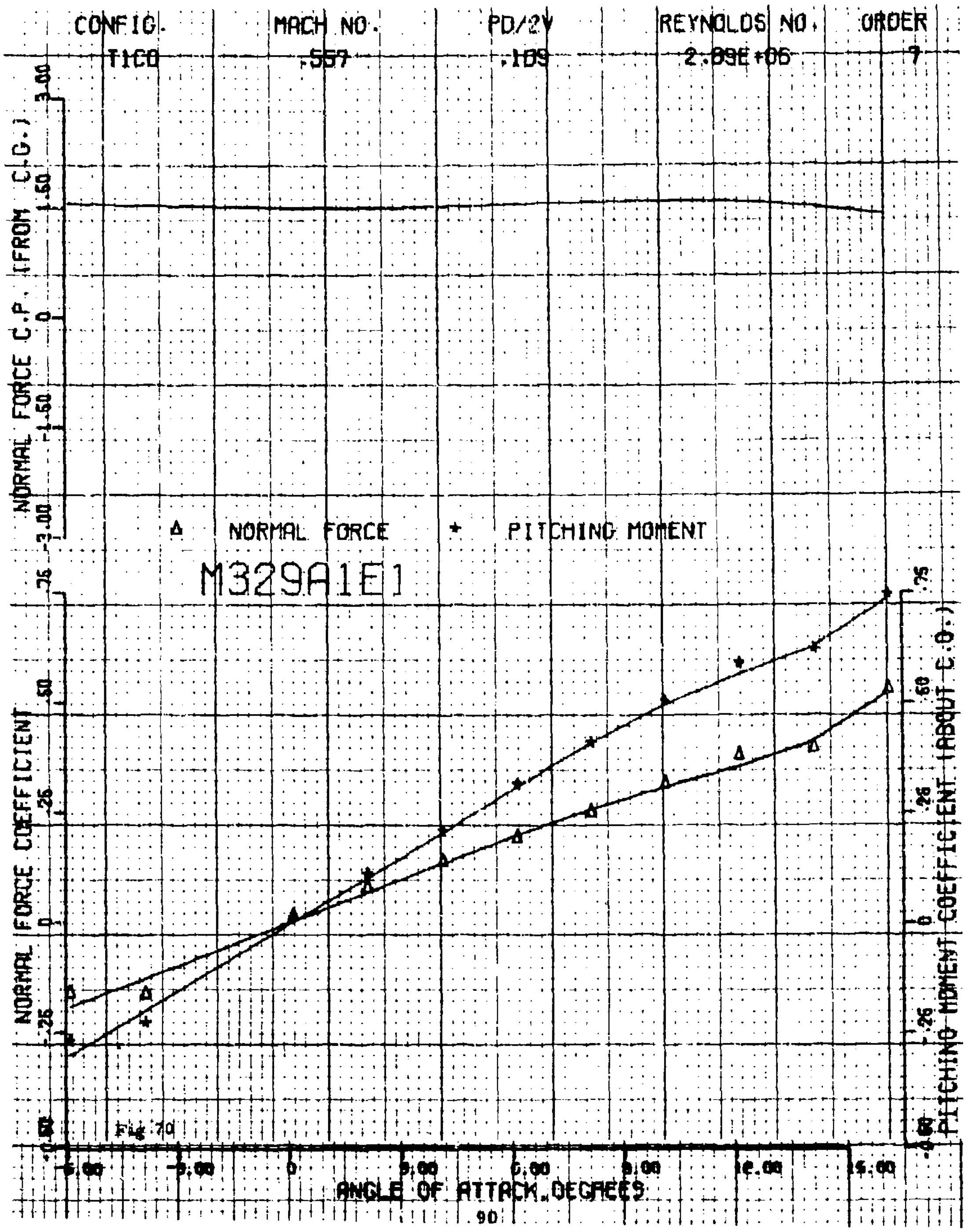

CONFIG. TICO
MACH NO. .307
PD/2V .408
REYNOLDS NO. 2.36E+06
ORDER 11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 57

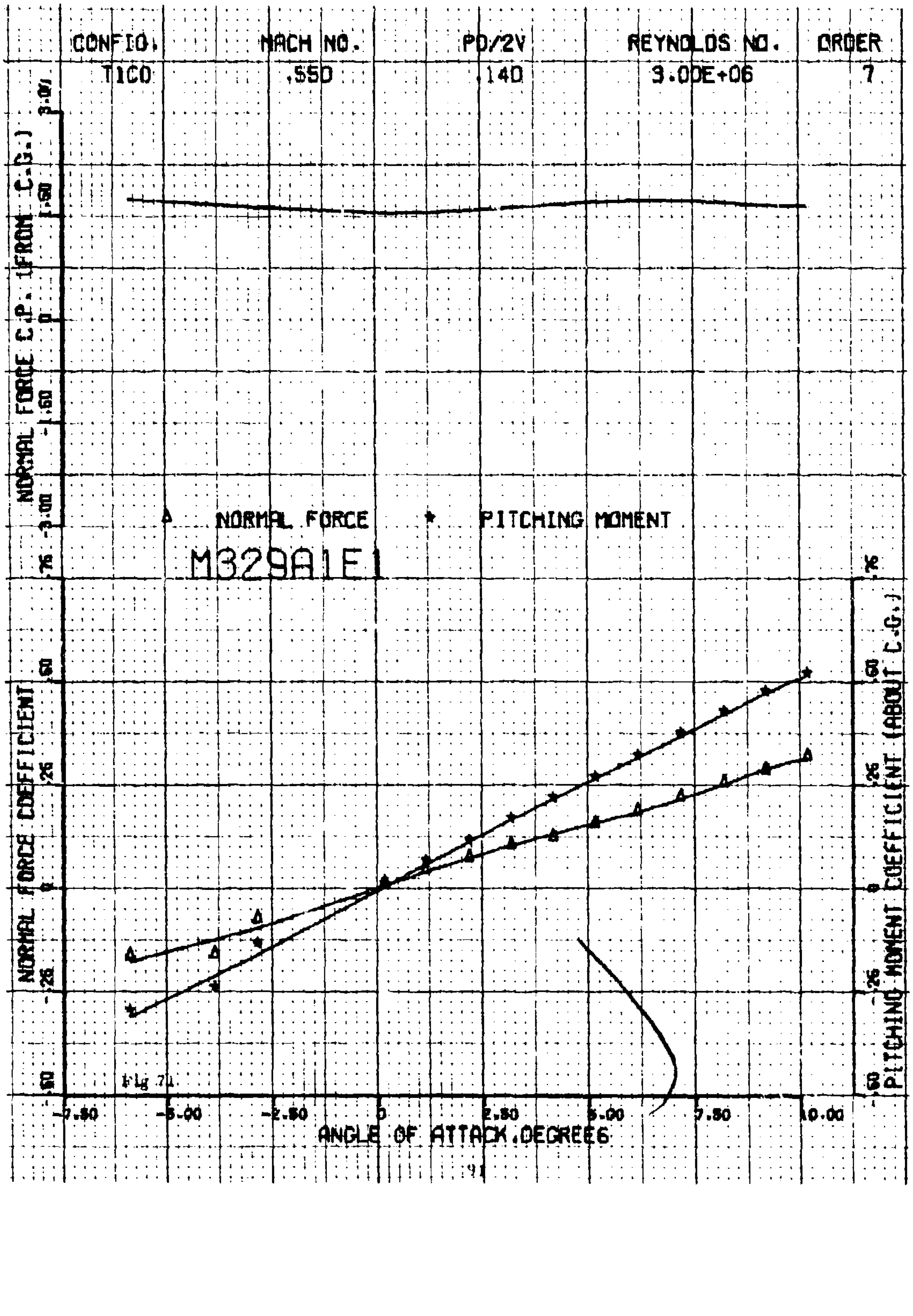

CONFIG. TICO
MACH NO. .307
PD/2V .510
REYNOLDS NO. 2.98E+06
ORDER 11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 68

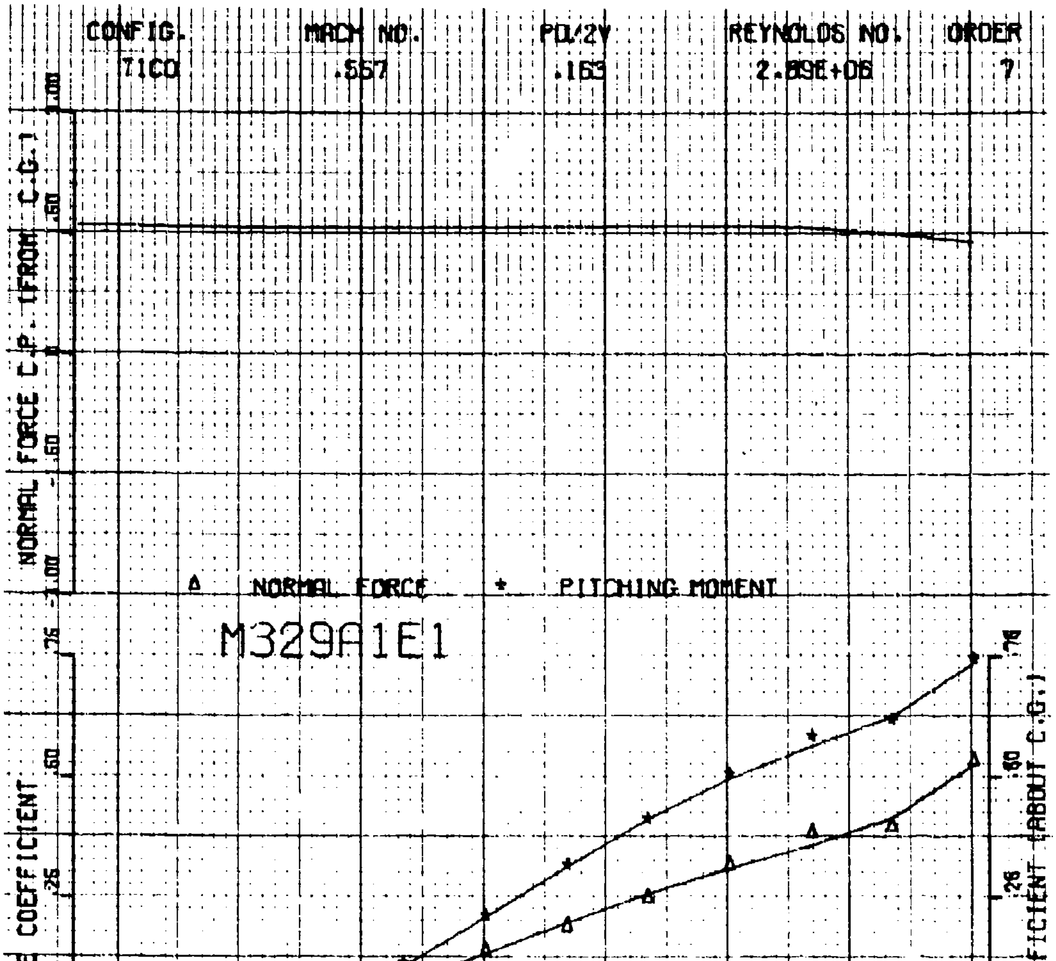


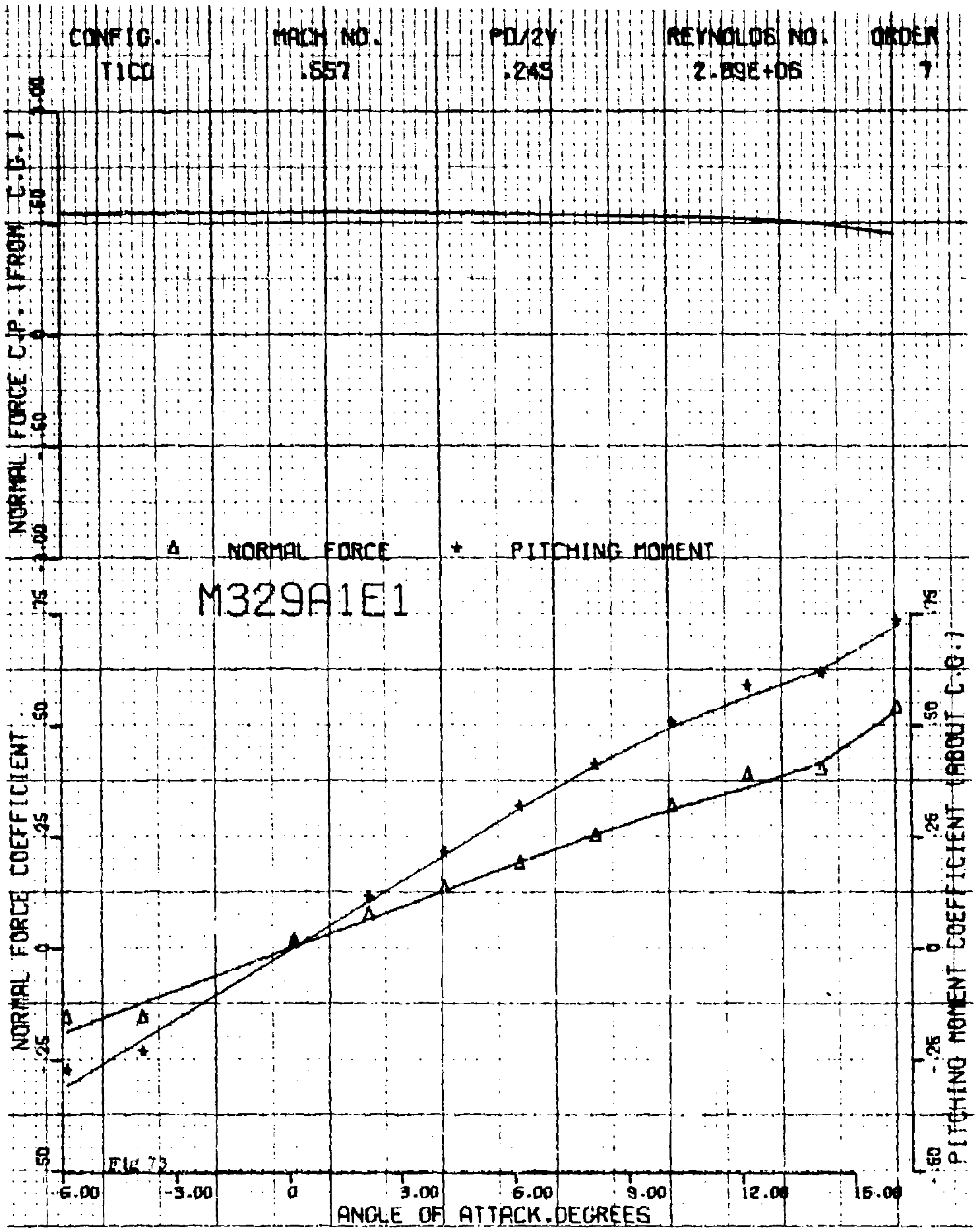
CONFIG.
T1C0
MACH NO.
.550
P0/2V
.084
REYNOLDS NO.
9.00E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

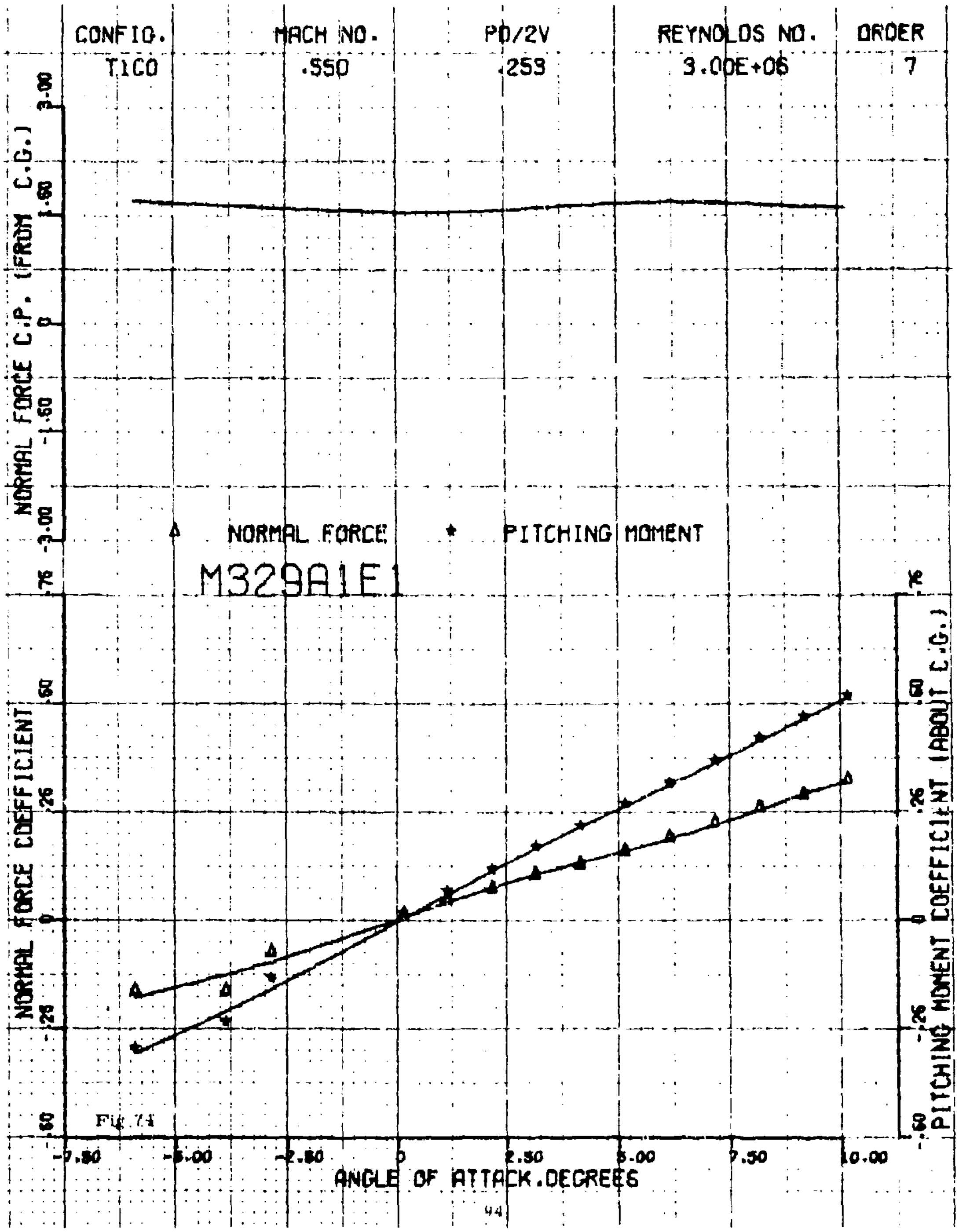
Fig 69


CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C0 .557 .109 2.09E+06 7
NORMAL FORCE C.P. (FROM C.G.)
Δ NORMAL FORCE + PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 70
ANGLE OF ATTACK, DEGREES


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C0
.550
.140
3.00E+06
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES
Fig 71

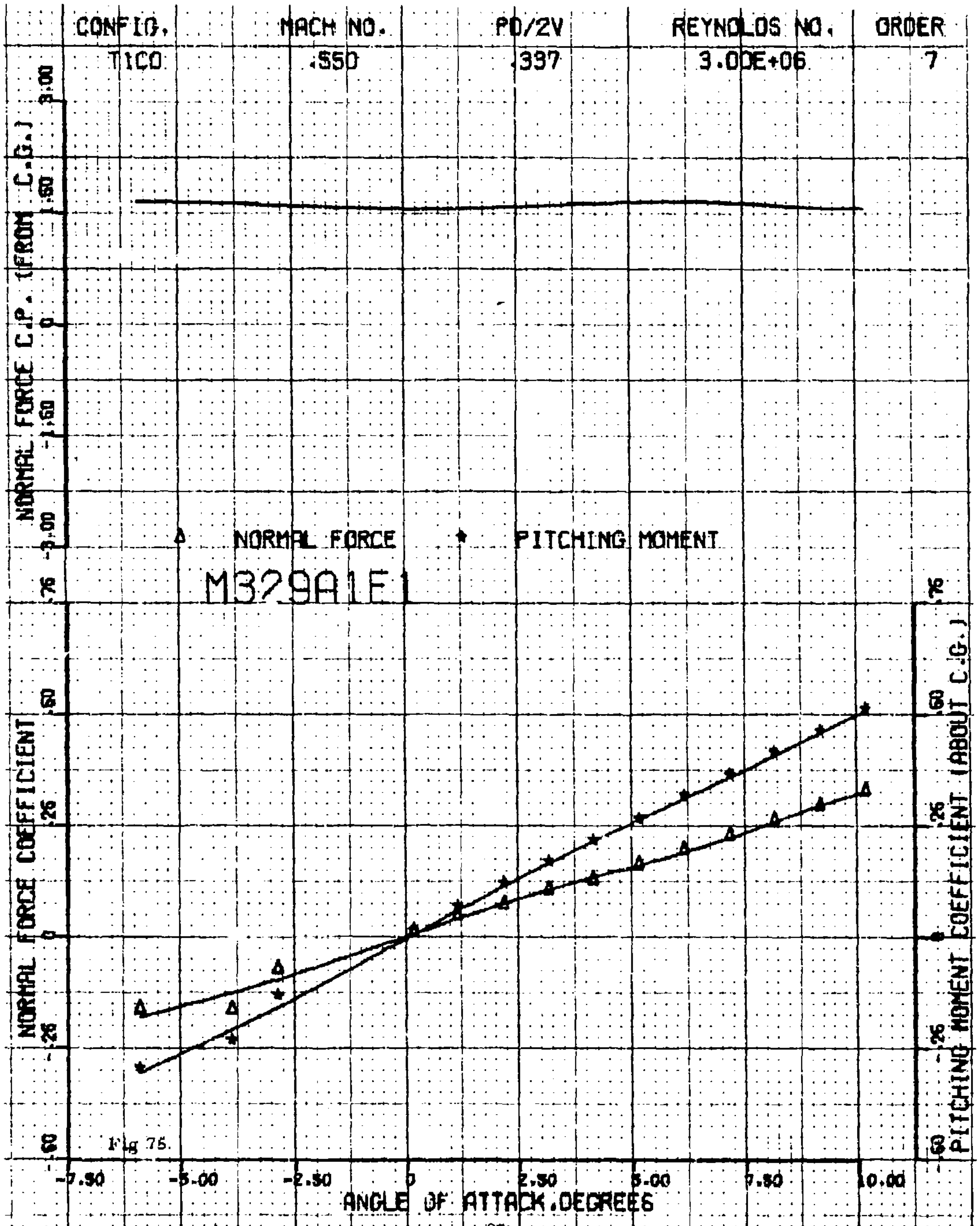

CONFIG.
T1C0
MACH NO.
.557
PD/2V
.163
REYNOLDS NO.
2.89E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
Fig 72


CONFIG.
TICO
MACH NO.
.557
PD/2V
.245
REYNOLDS NO.
2.89E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
1.00
.50
0
-.50
-1.00
Δ NORMAL FORCE
+ PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.75
.50
.25
0
-.25
-.50
Fig 73
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES



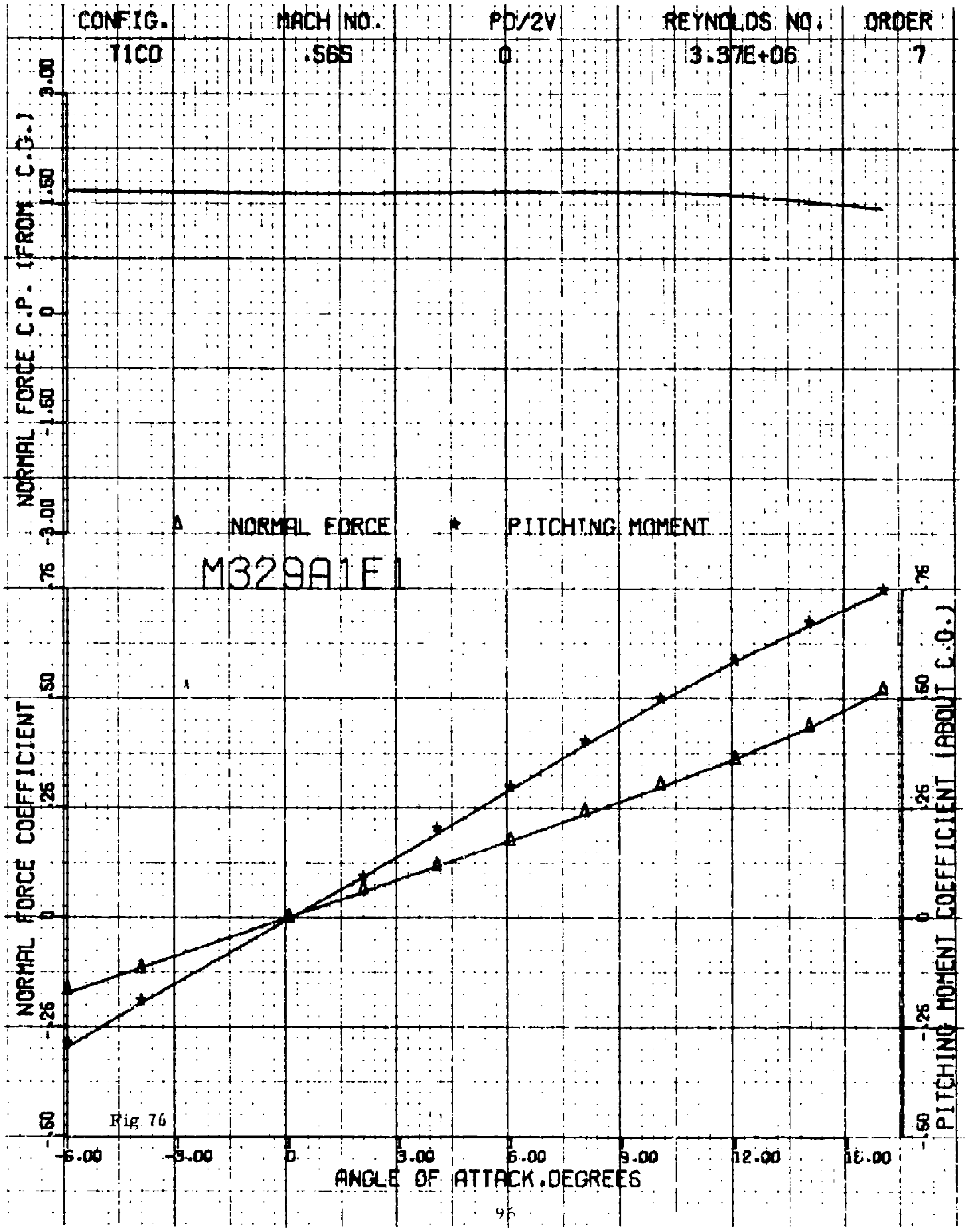
CONFIG. TICO
MACH NO. .550
PD/2V .253
REYNOLDS NO. 3.00E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

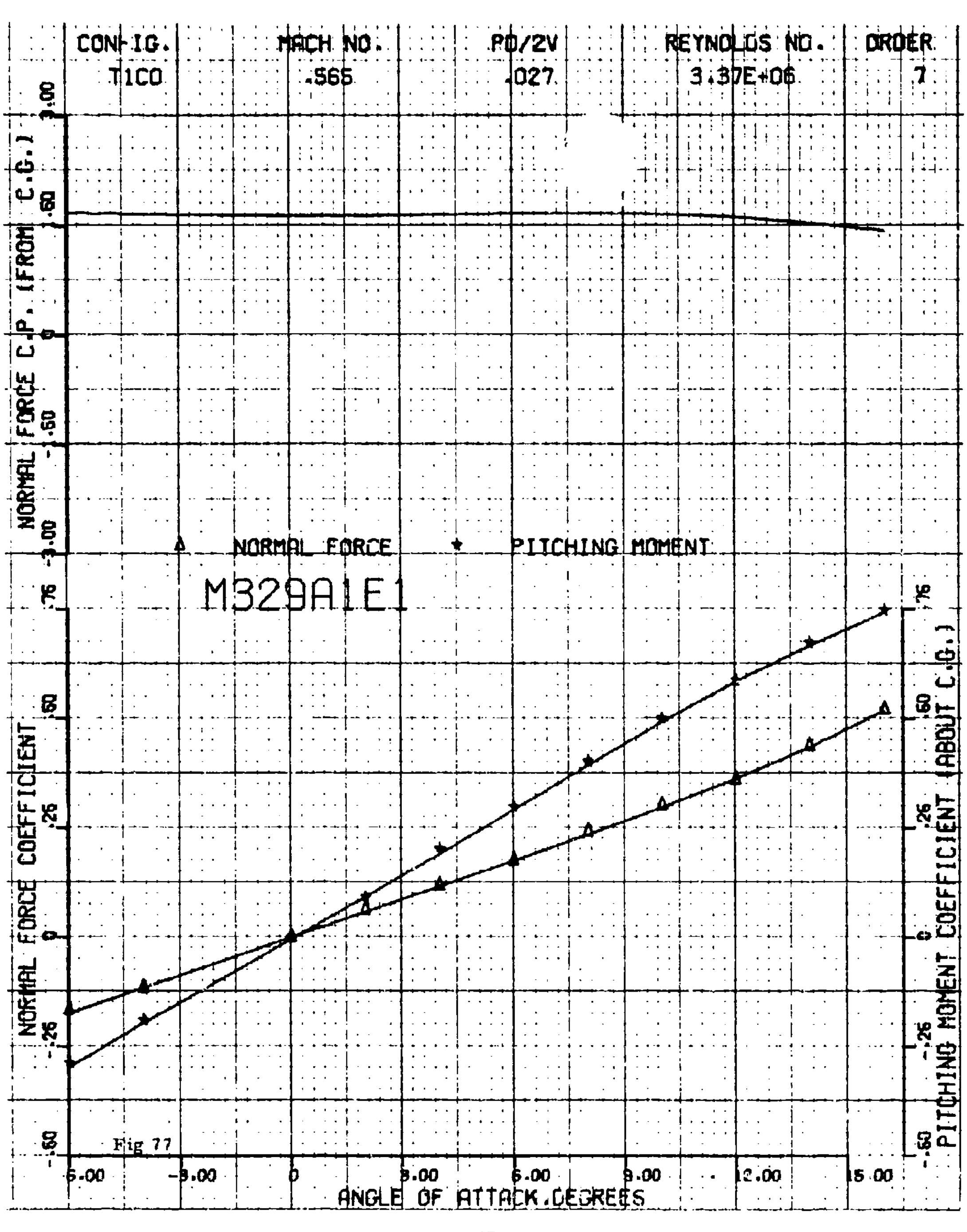
Fig. 74

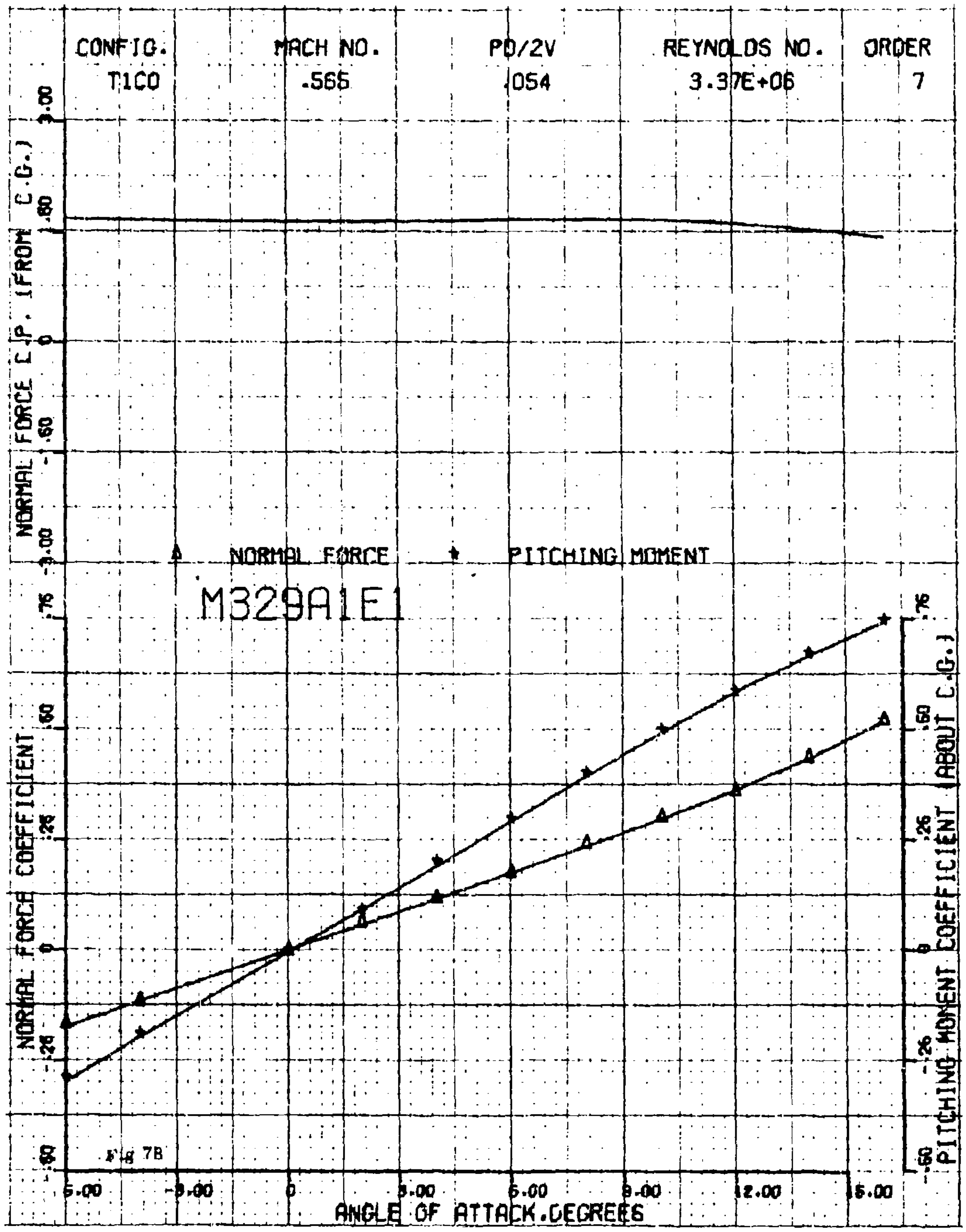


CONFIG.
TICO
MACH NO.
.550
PD/2V
.397
REYNOLDS NO.
3.00E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 75.

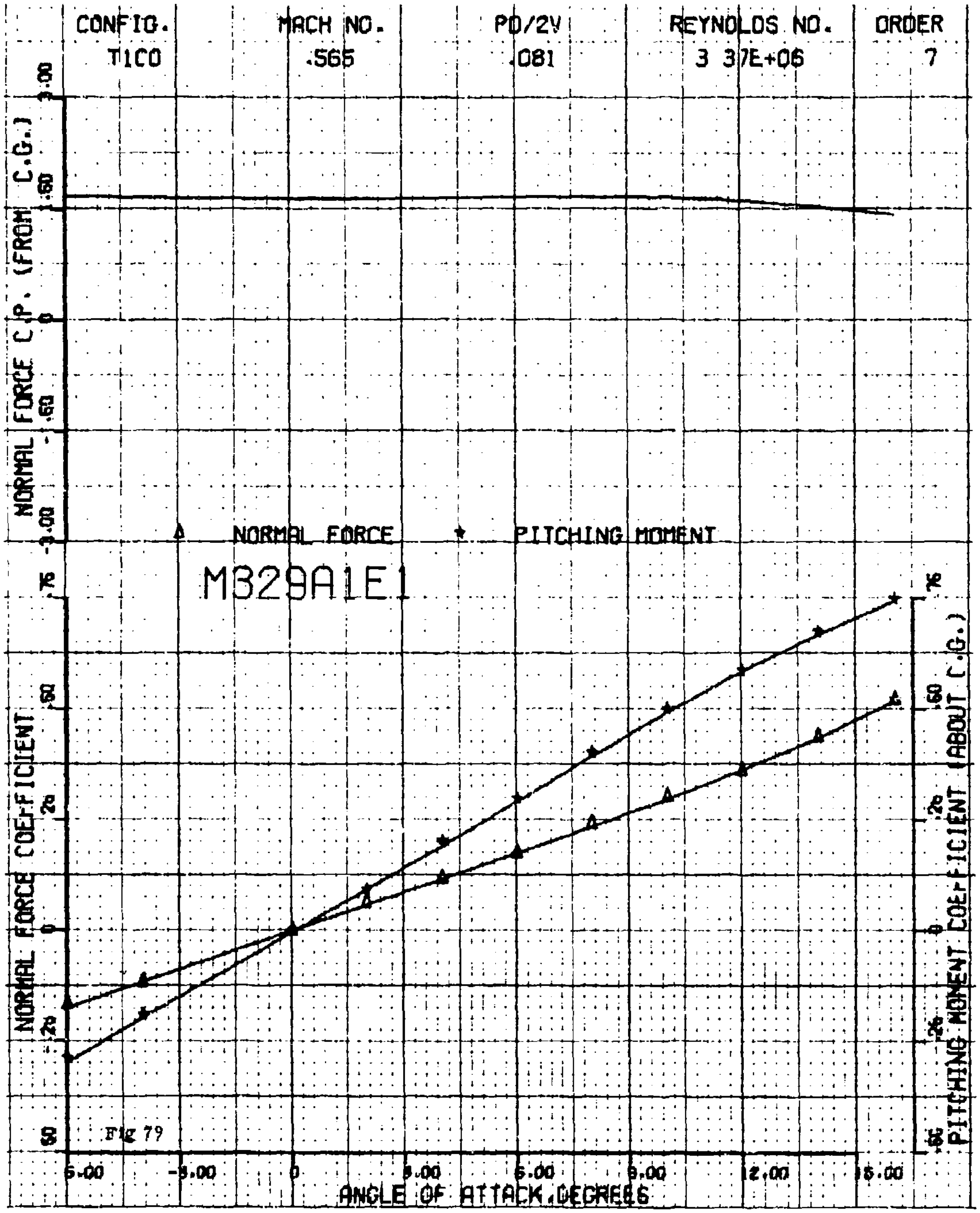

CONFIG.
T1C0
MACH NO.
.565
PD/2V
0
REYNOLDS NO.
3.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES
Fig. 76


CONFIG.
T1CO
MACH NO.
.565
PD/2V
.027
REYNOLDS NO.
3.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 77



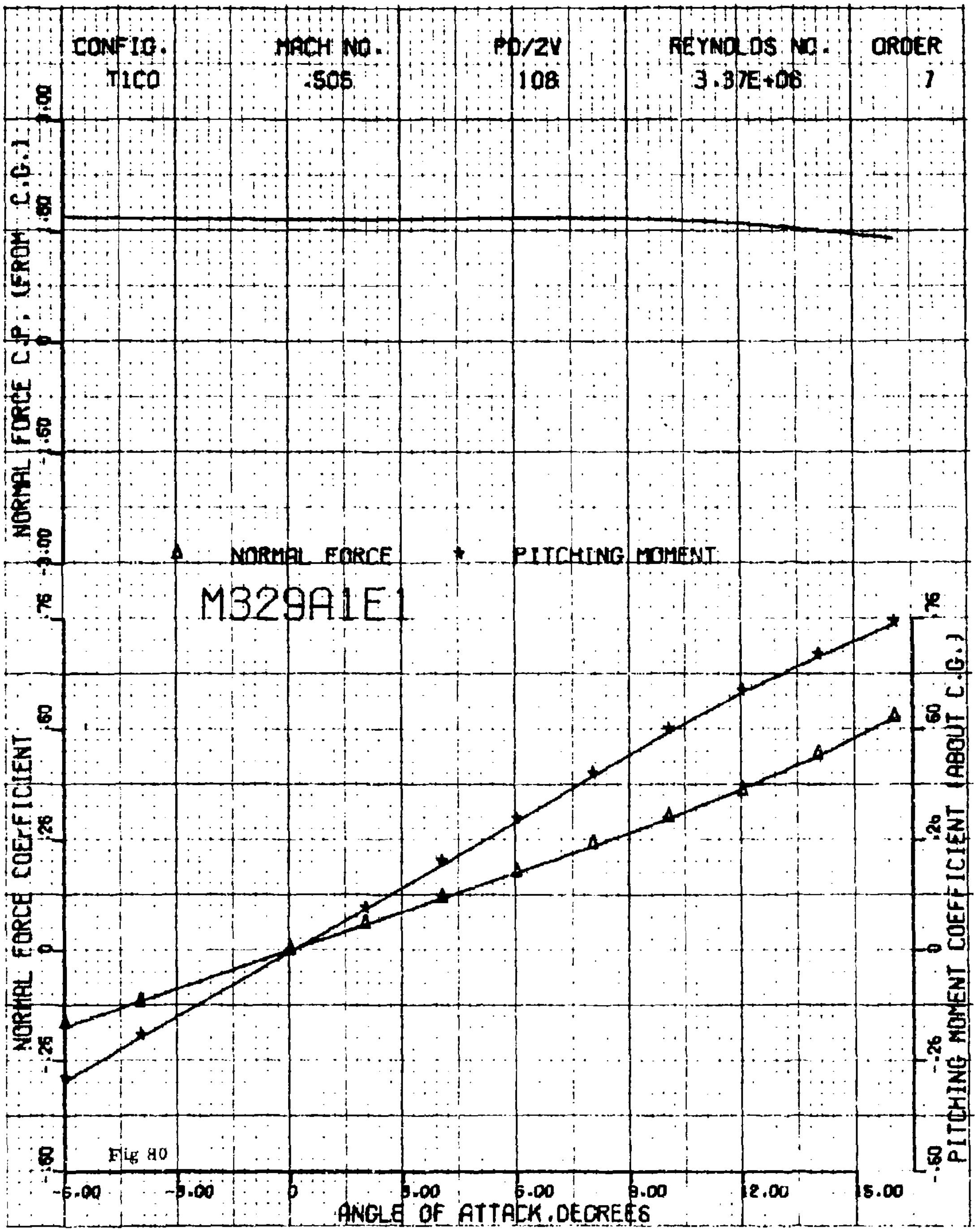
CONFIG.
T1C0
MACH NO.
.565
PD/2V
.054
REYNOLDS NO.
3.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES

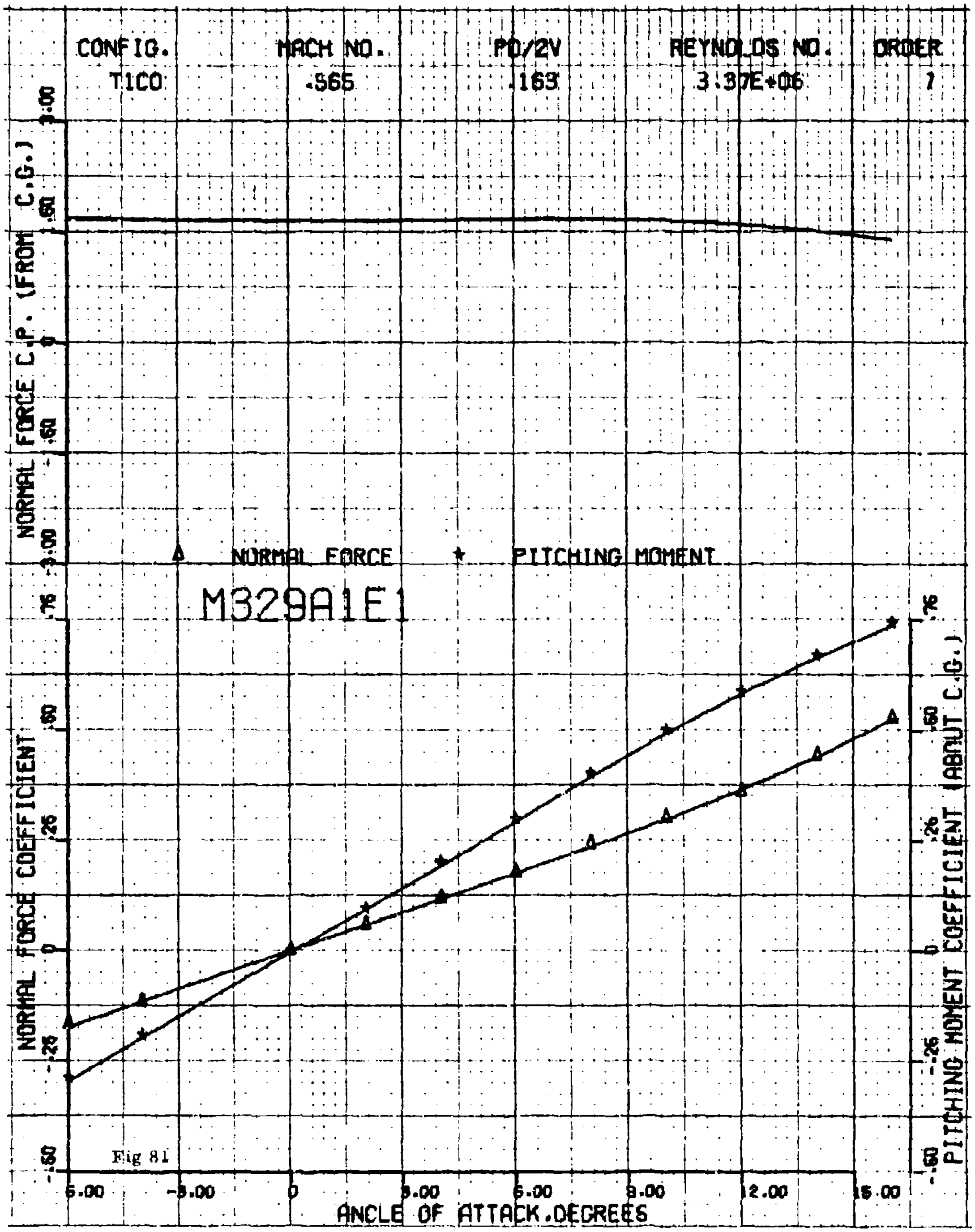
Fig 7B



CONFIG.
T1C0
MACH NO.
.565
PD/2V
.081
REYNOLDS NO.
3 37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 79


CONFIG. TICO
MACH NO. .505
PD/2V 108
REYNOLDS NO. 3.37E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 80


CONFIG. TICO
MACH NO. .565
PD/2V .163
REYNOLDS NO. 3.37E+06
ORDER 1
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 81

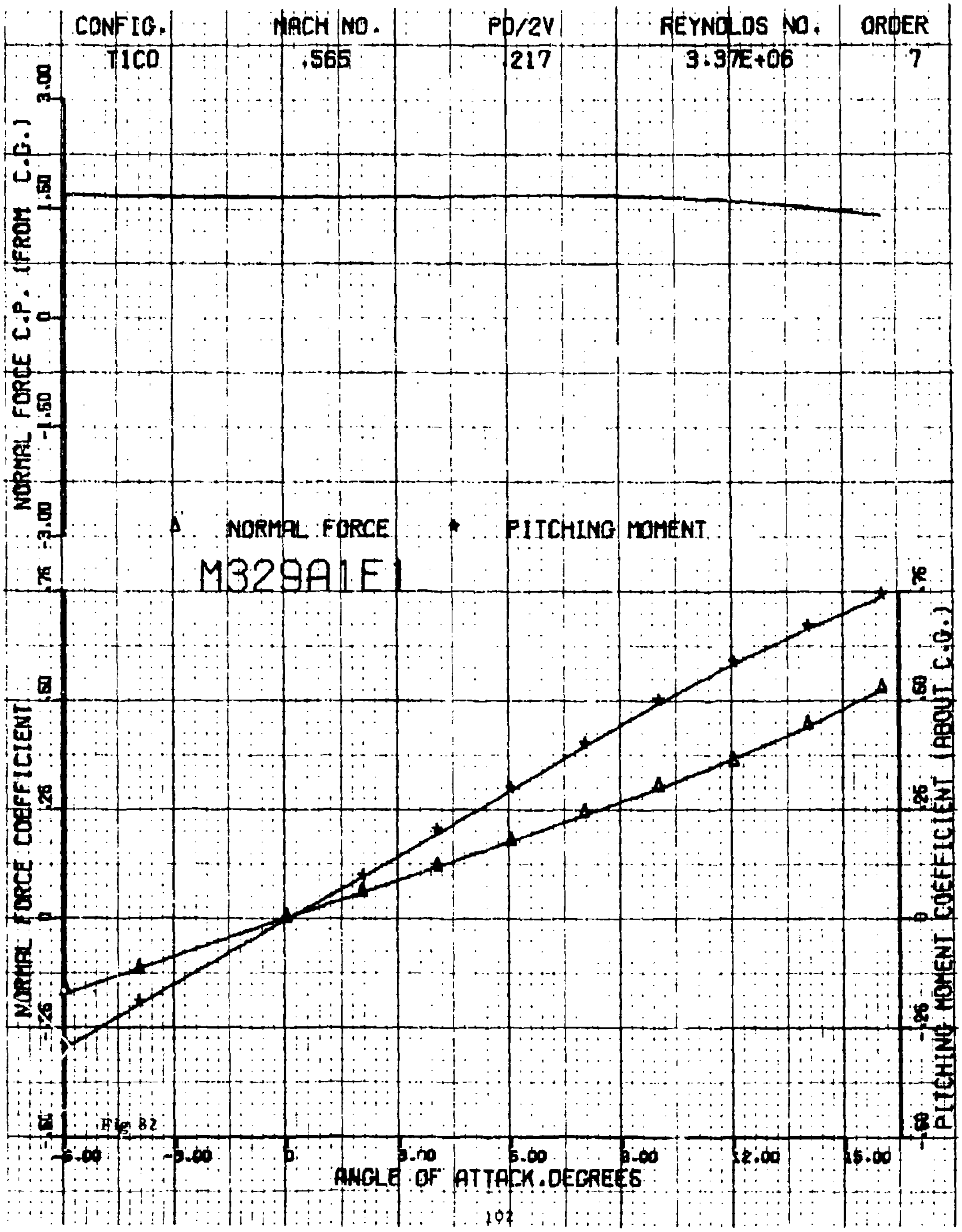
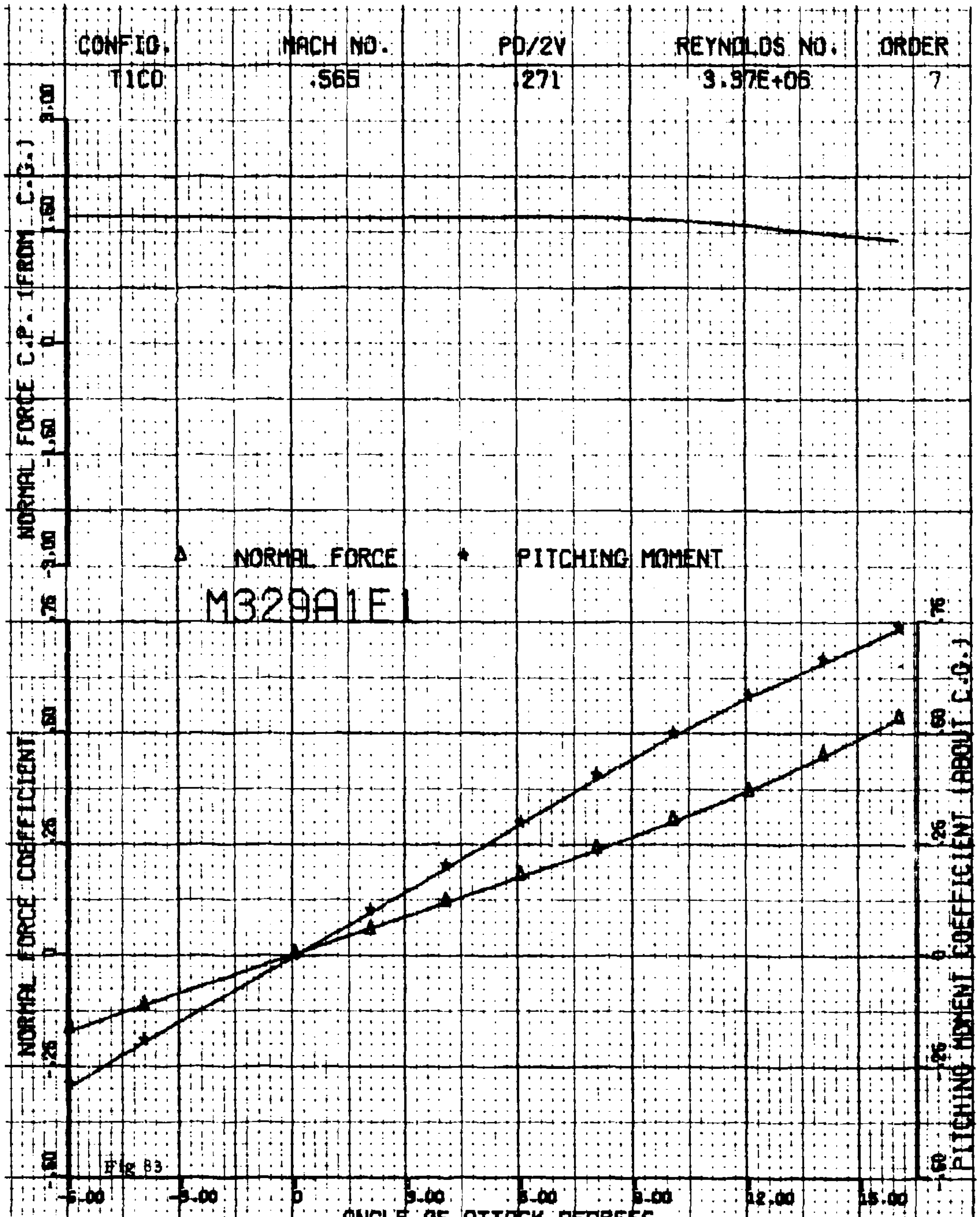
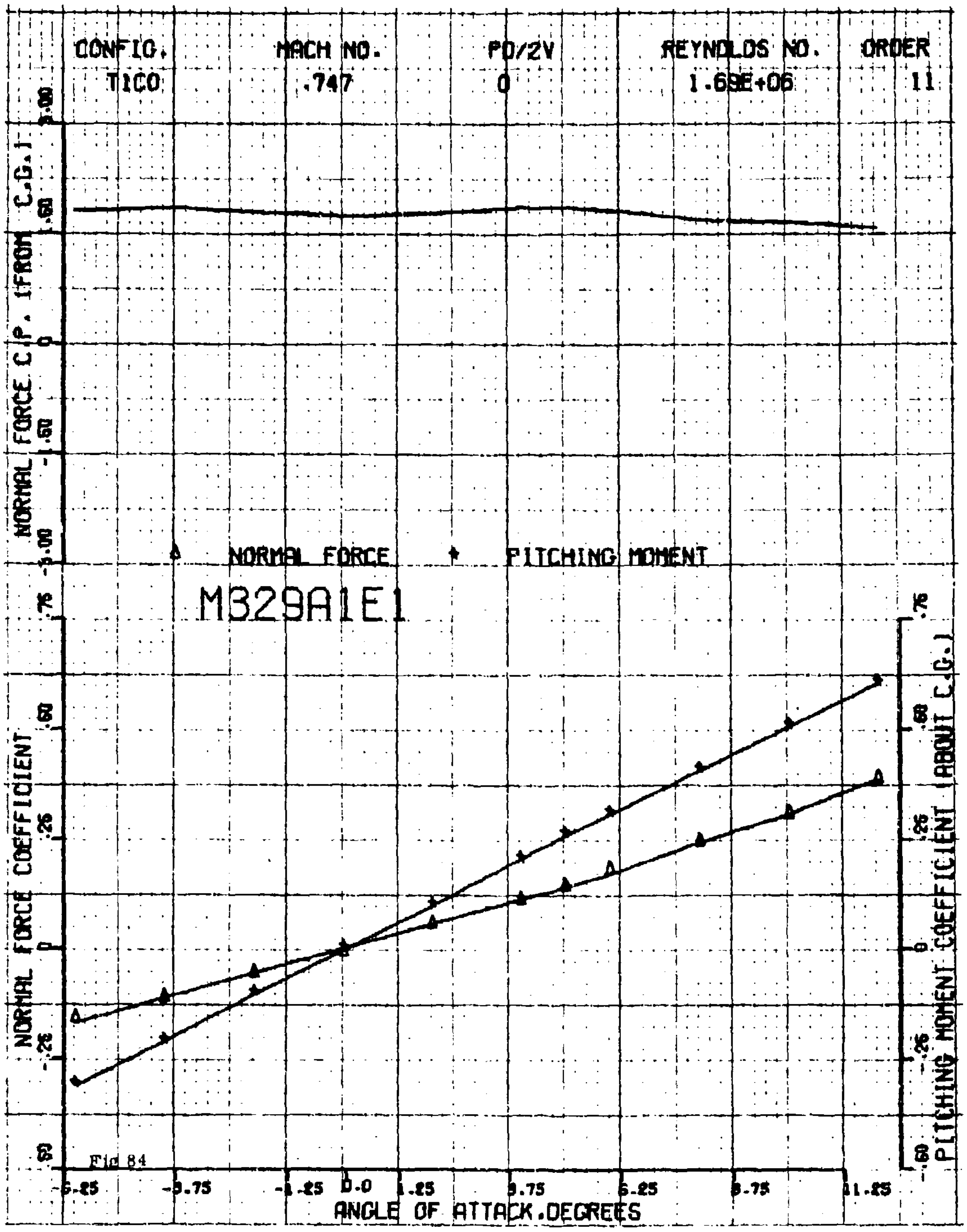

CONFIG.
T1CO
MACH NO.
.565
PD/2V
.217
REYNOLDS NO.
3.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
Δ NORMAL FORCE
* PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.76
.50
.25
0
-.25
-.50
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

Fig 82

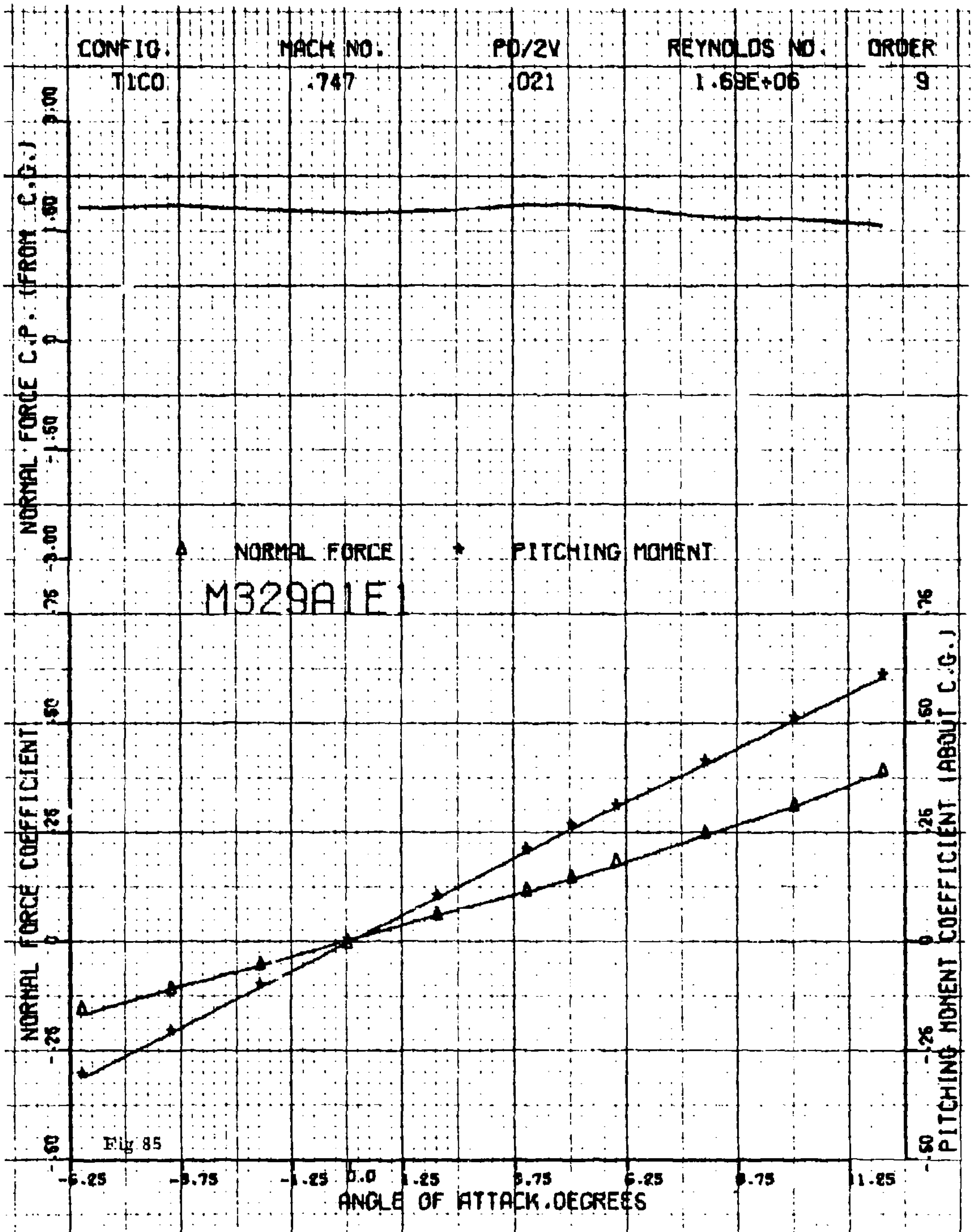


CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1CO .565 .271 3.97E+06 7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
Δ NORMAL FORCE * PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig B3
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES



CONFIG.
TICO
MACH NO.
.747
PD/2V
0
REYNOLDS NO.
1.69E+06
ORDER
11
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25

Fig 84



CONFIG. TICO
MACH NO. .747
PD/2V .021
REYNOLDS NO. 1.69E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.75
.50
.25
0
-.25
-.50
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK, DEGREES

Fig 85

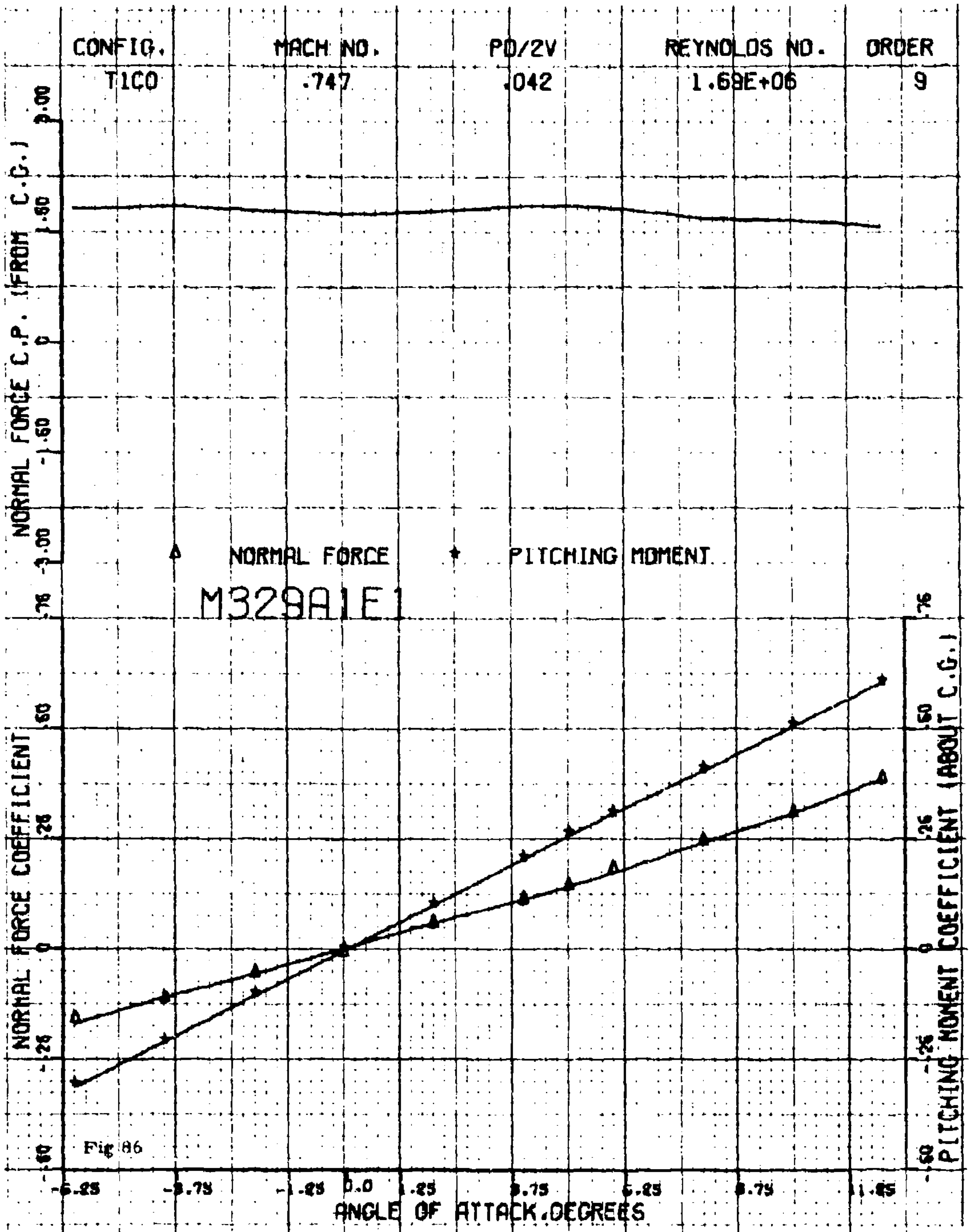
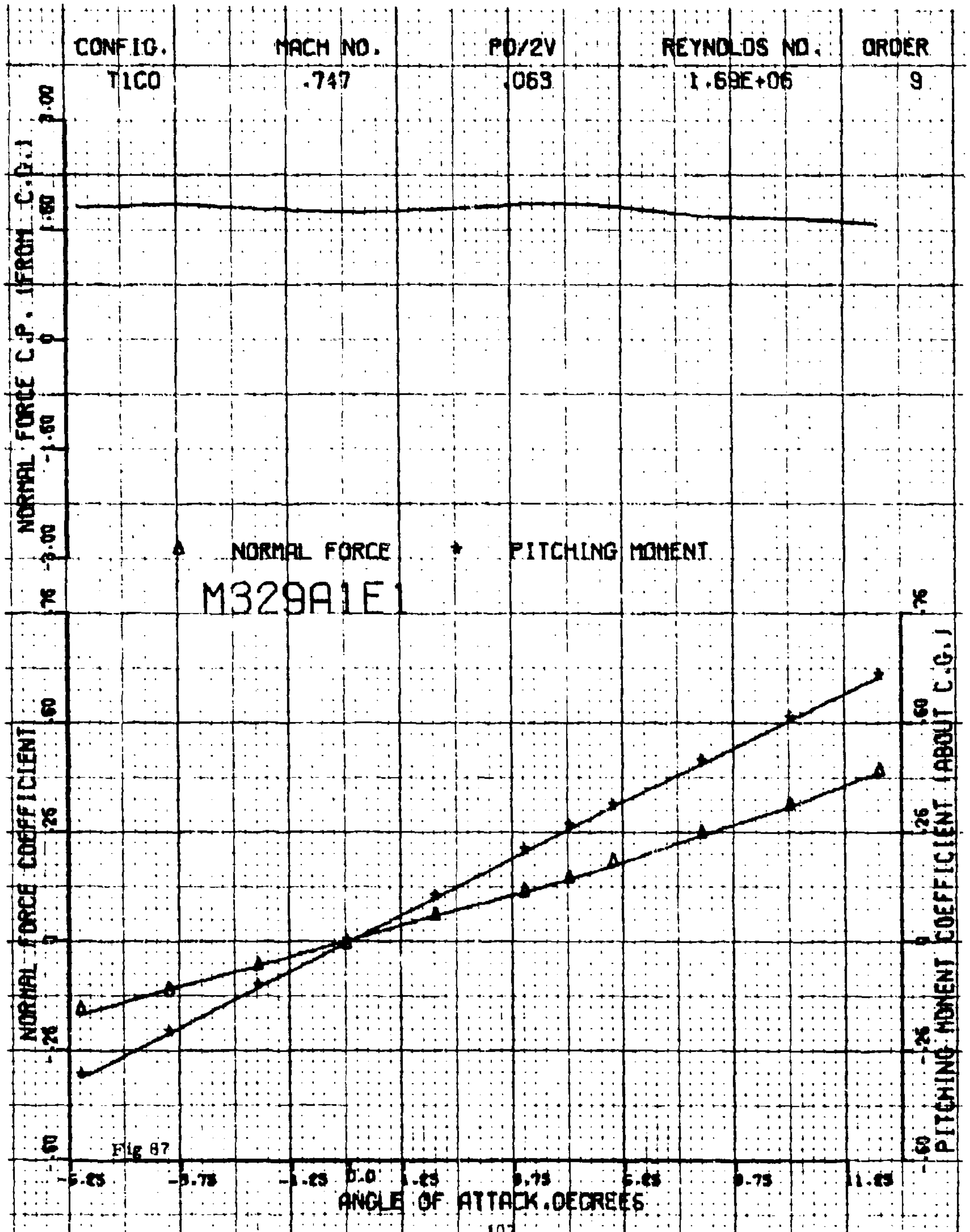
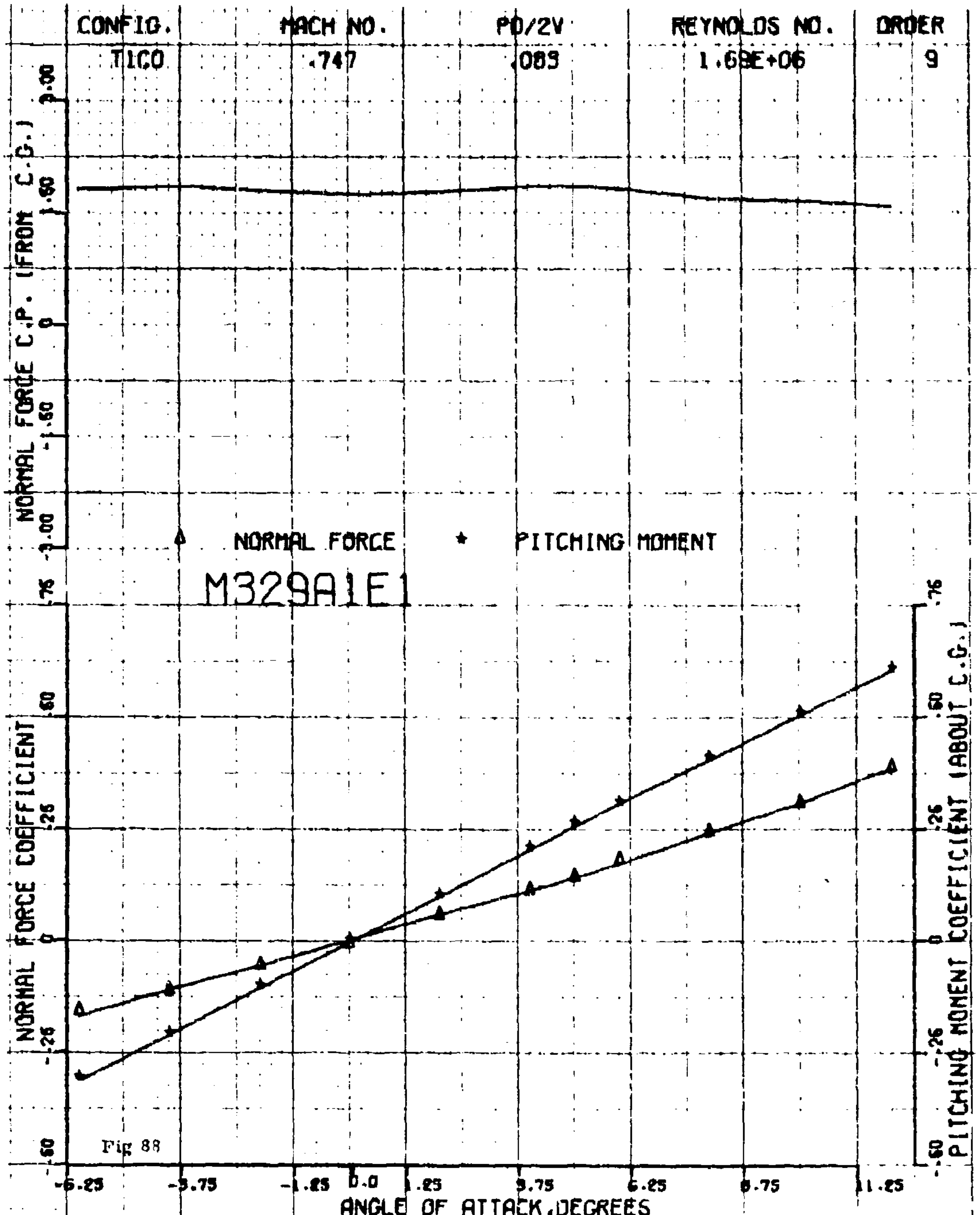

CONFIG.
T1CO
MACH NO.
.747
PD/2V
.042
REYNOLDS NO.
1.69E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25

Fig 86


CONFIG.
T1C0
MACH NO.
.747
PD/2V
.063
REYNOLDS NO.
1.69E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 87



CONFIG.
TICO
MACH NO.
.747
PD/2V
.089
REYNOLDS NO.
1.69E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 88

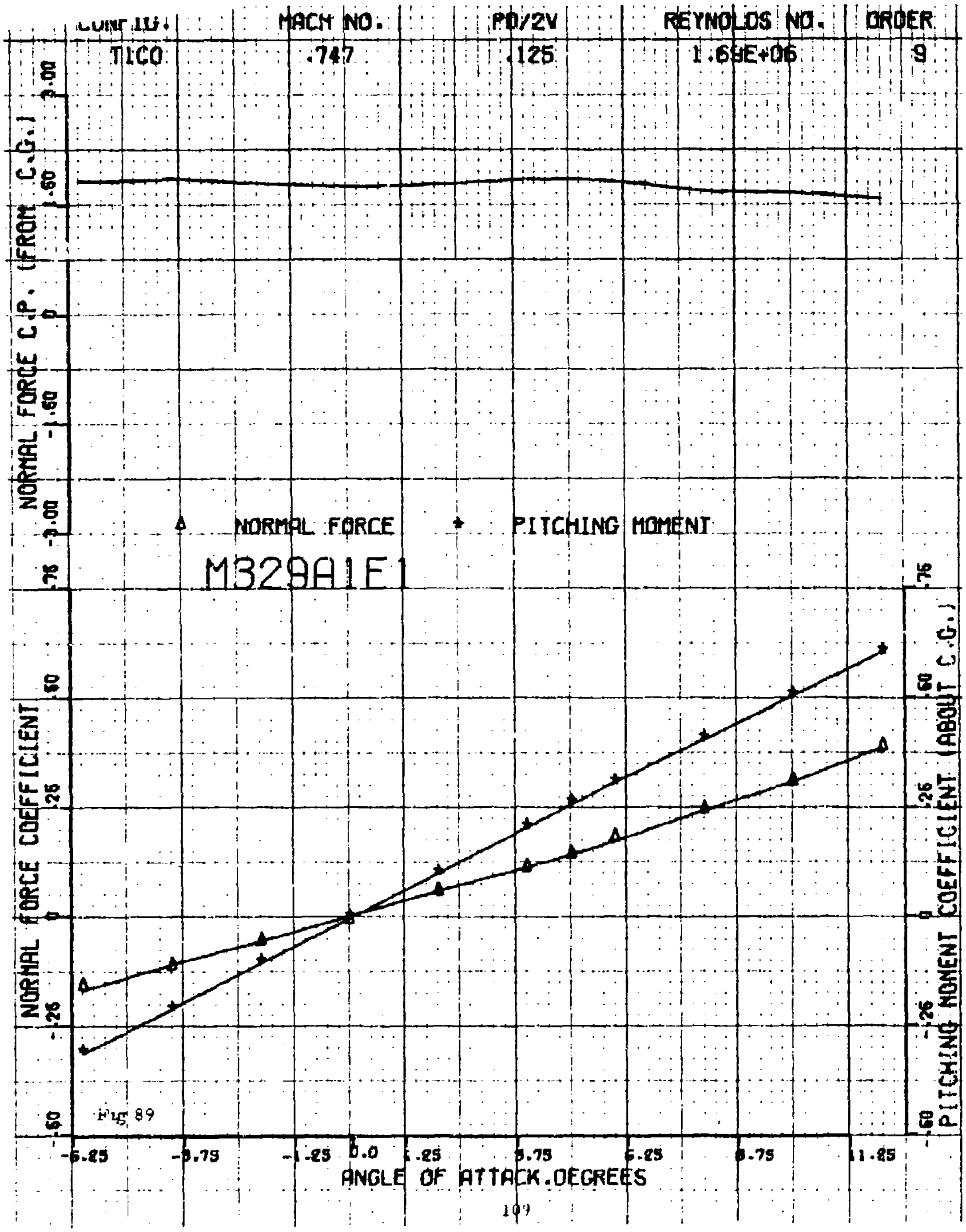

CONFIG. TICO
MACH NO. .747
PD/2V .125
REYNOLDS NO. 1.69E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK.DEGREES

Fig 89

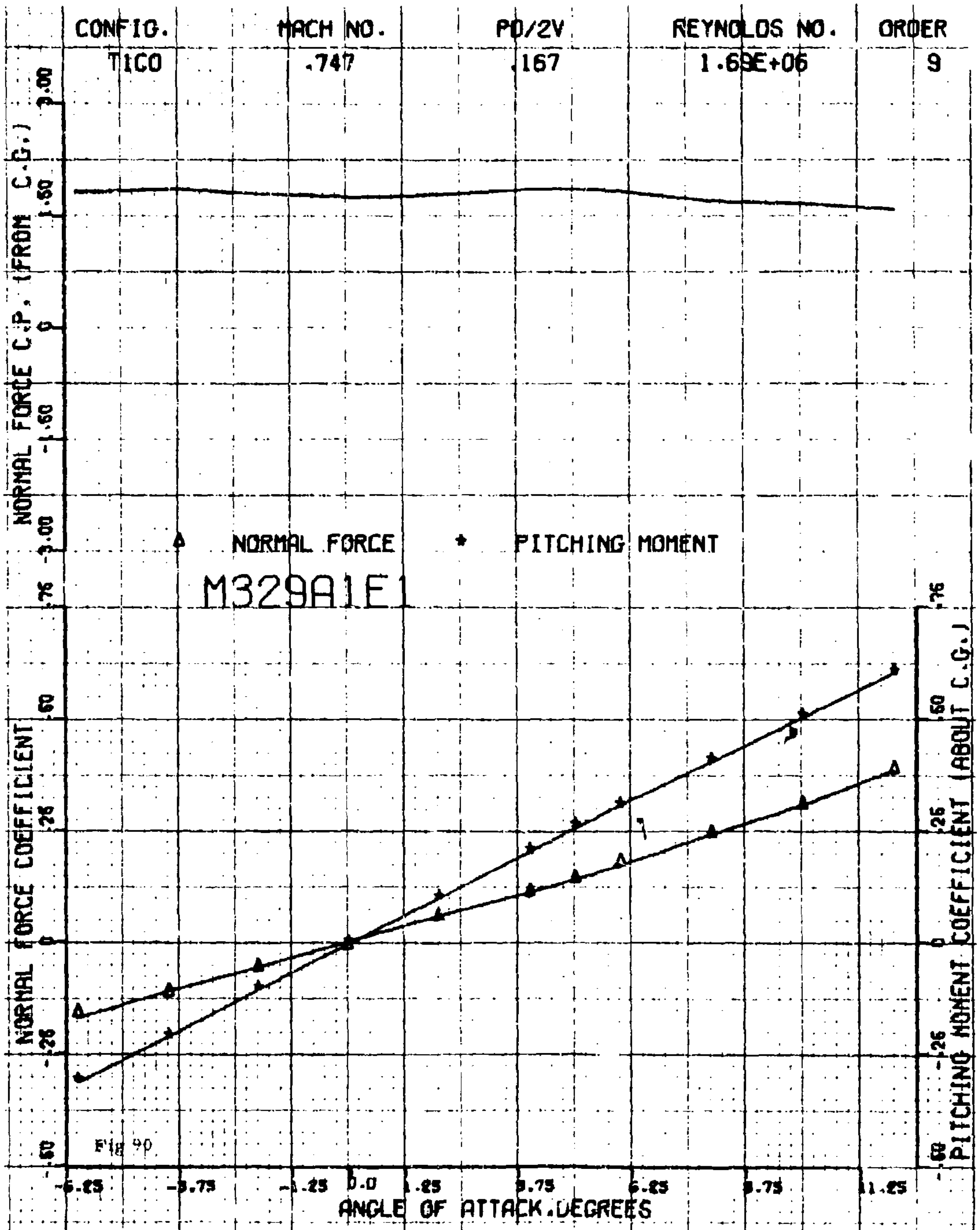
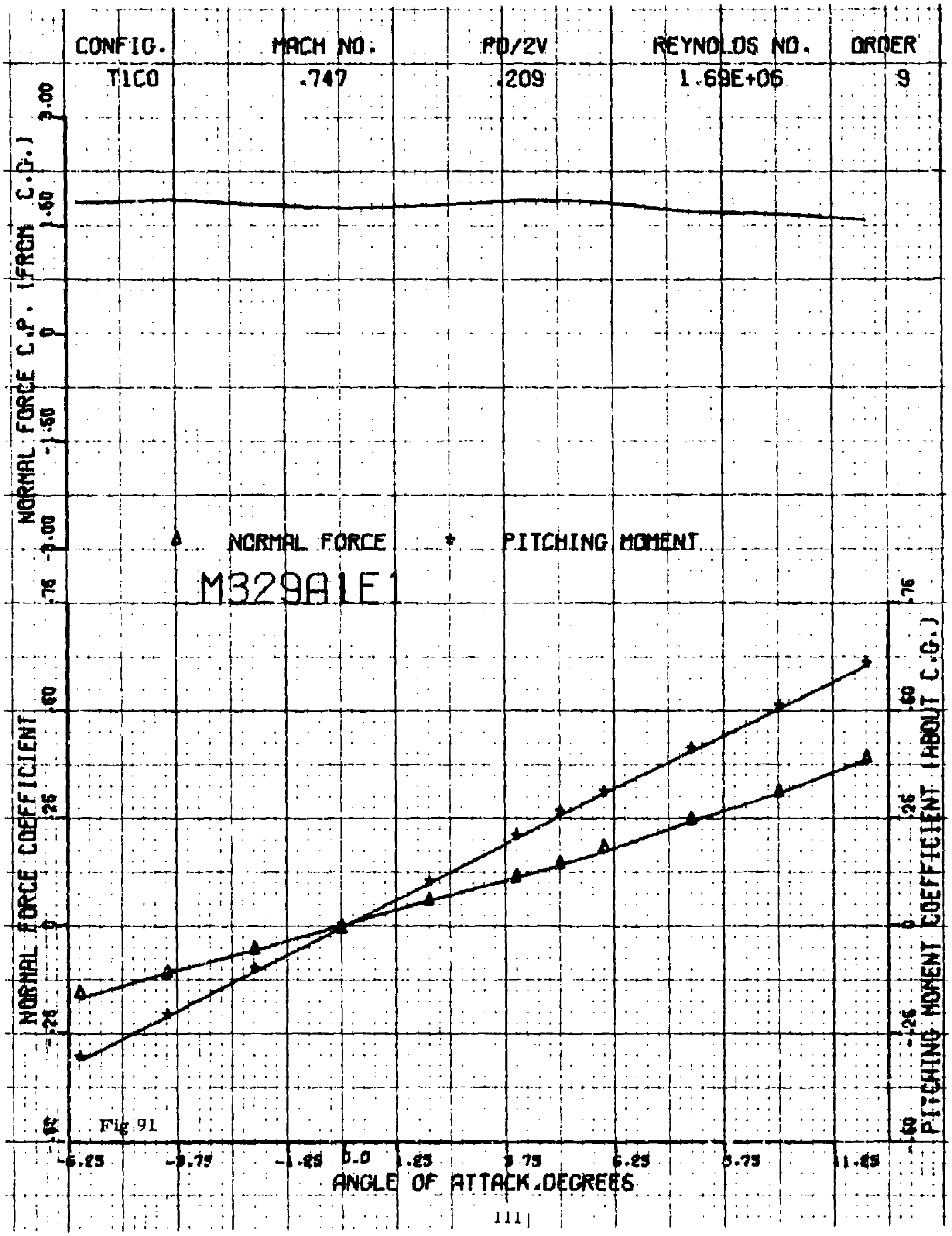
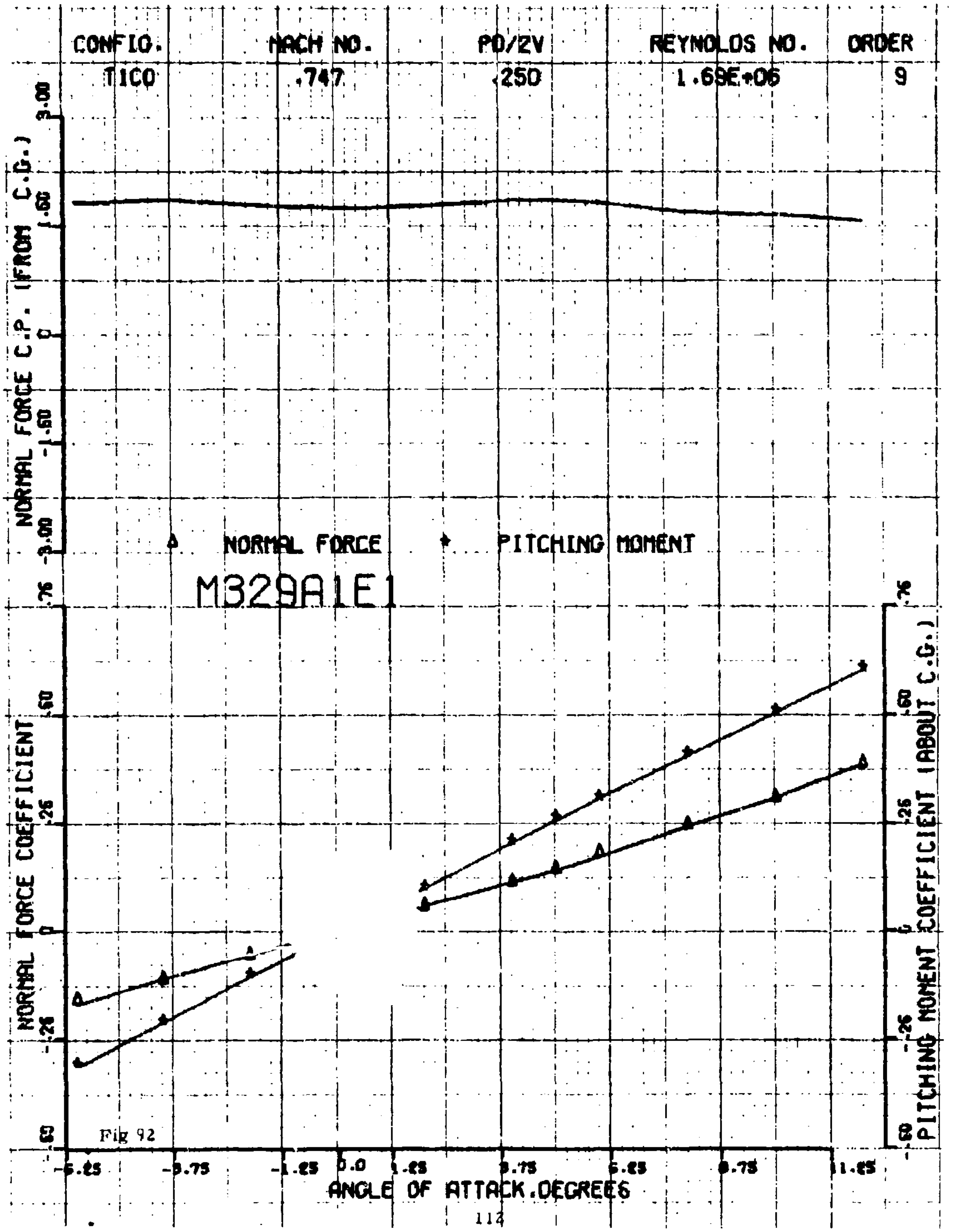

CONFIG. TICO
MACH NO. .747
PD/2V .167
REYNOLDS NO. 1.69E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 90



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.747
.209
1.69E+06
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 91


CONFIG.
TICO
MACH NO.
.747
PD/2V
.250
REYNOLDS NO.
1.69E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK,DEGREES
Fig 92

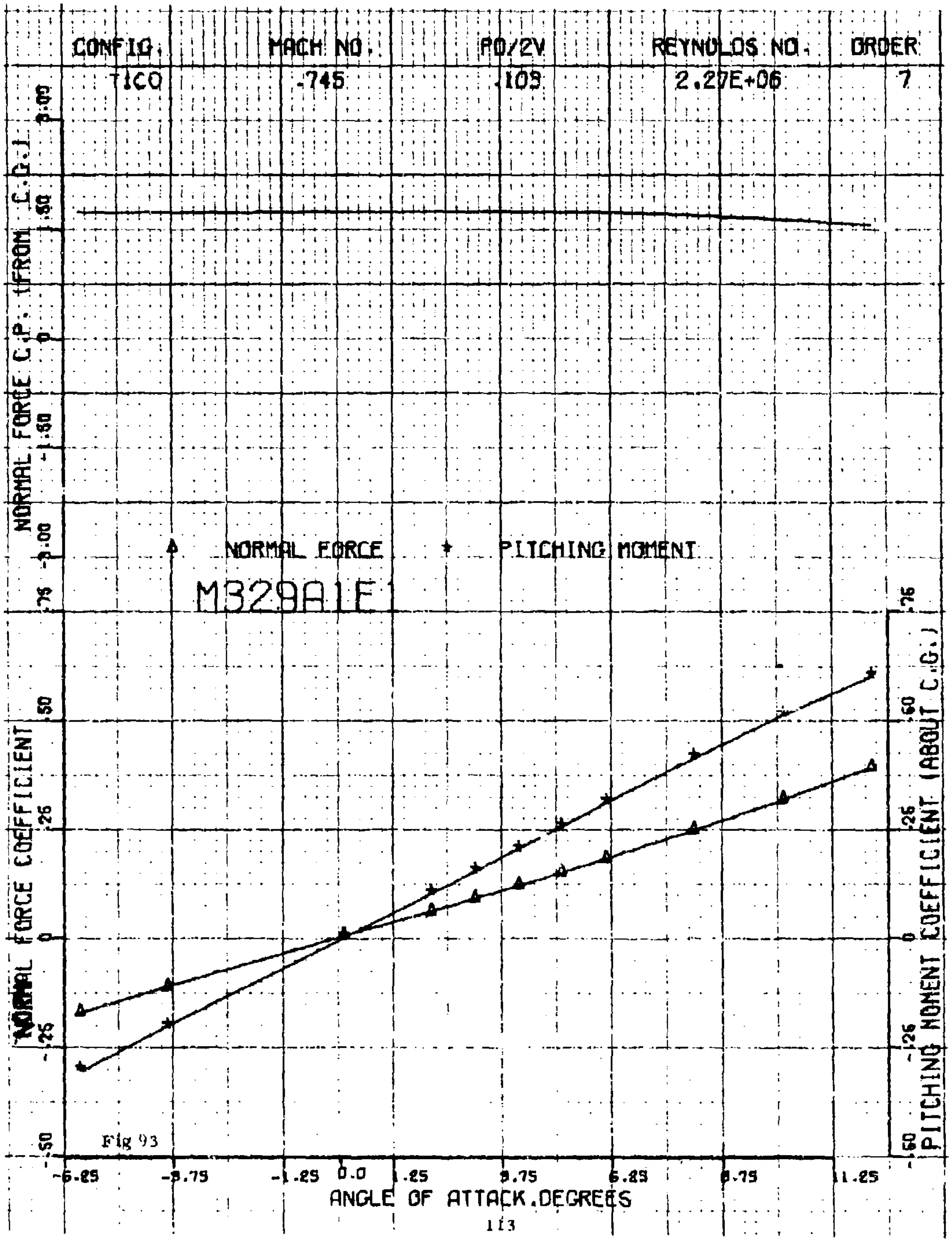
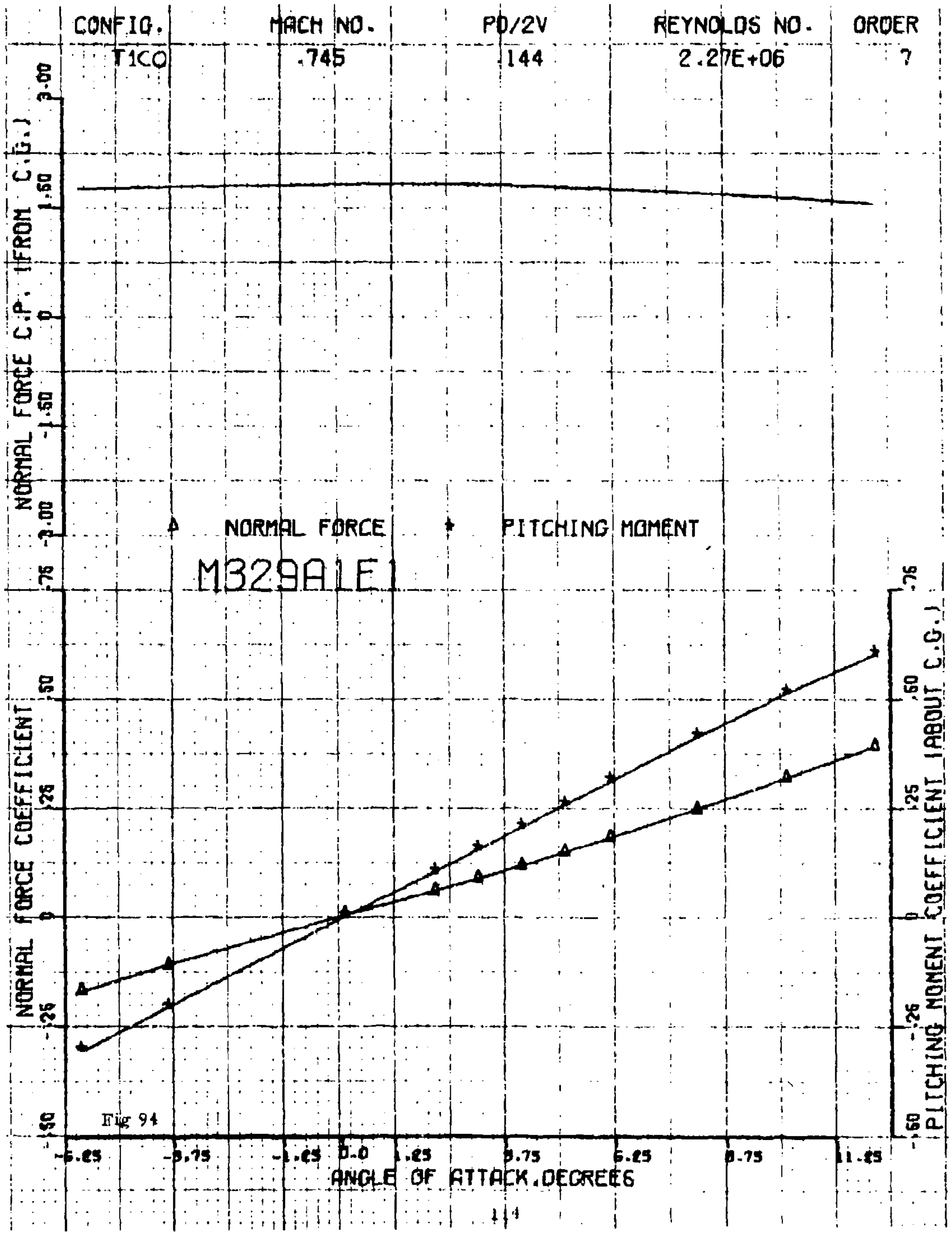

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
TICO .745 .103 2.27E+06 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 93



CONFIG. T1CO
MACH NO. .745
PD/2V .144
REYNOLDS NO. 2.27E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 94

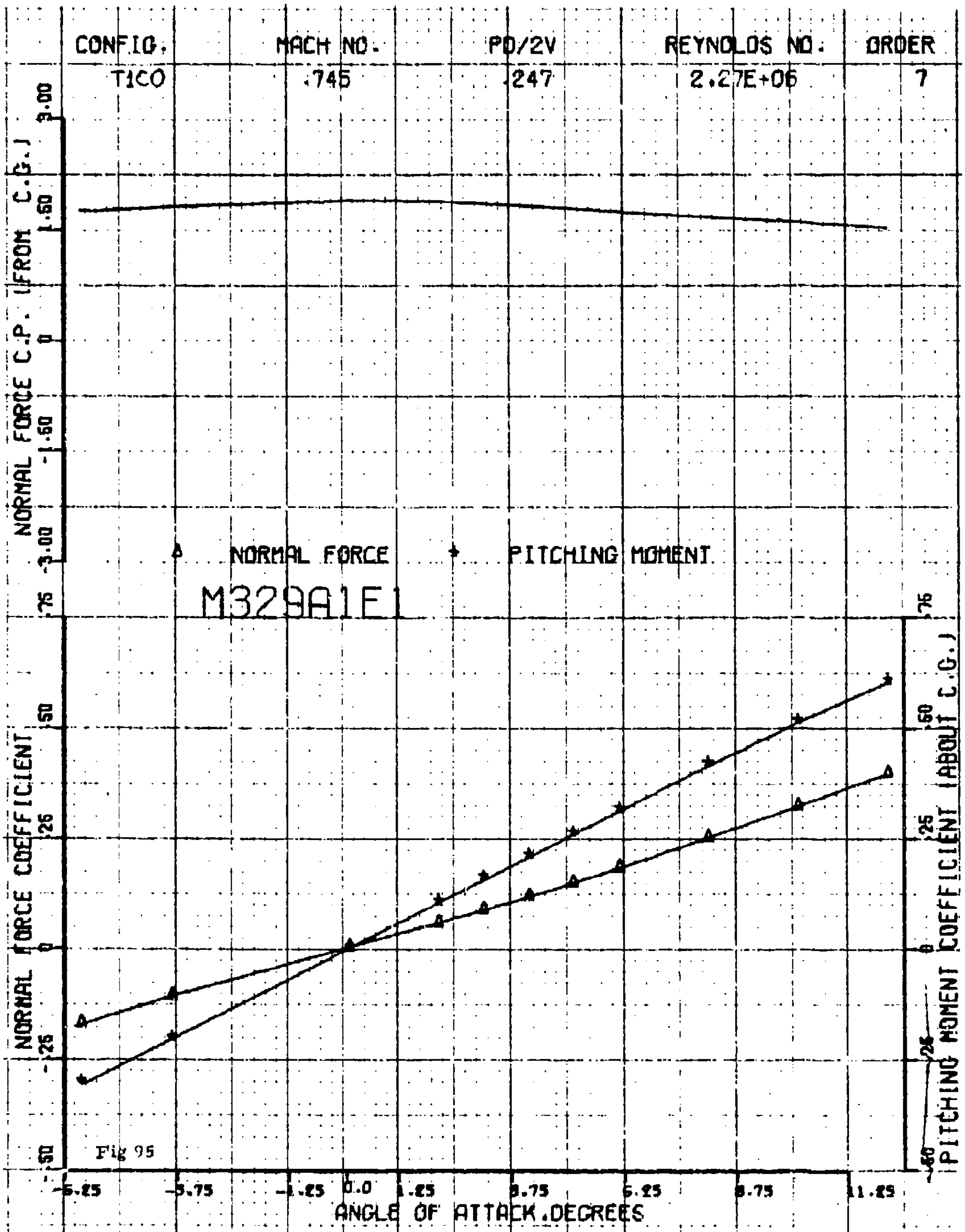
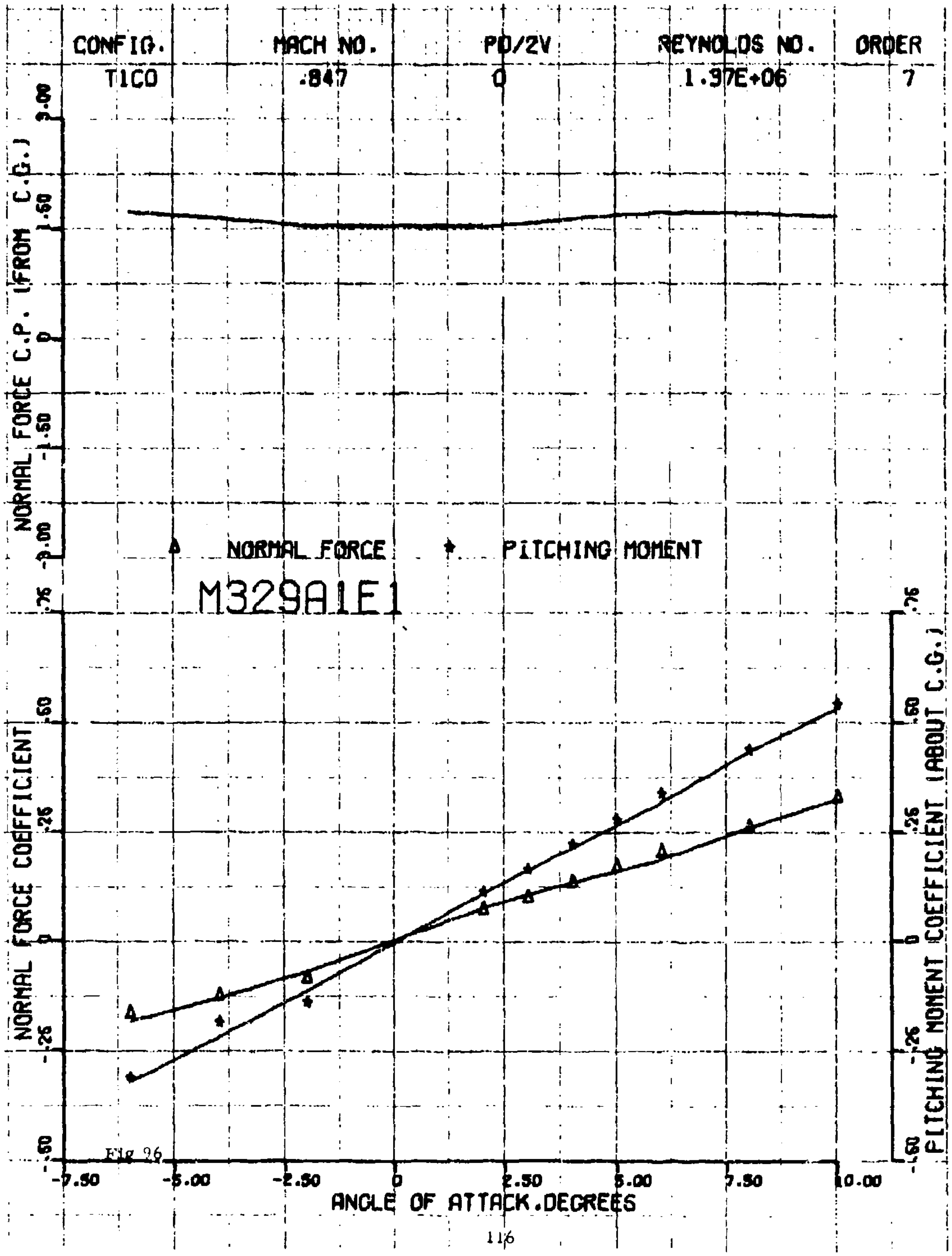

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1CO
.745
.247
2.27E+06
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK, DEGREES

Fig 95


CONFIG.
T1CO
MACH NO.
.847
PD/2V
0
REYNOLDS NO.
1.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES
Fig 26

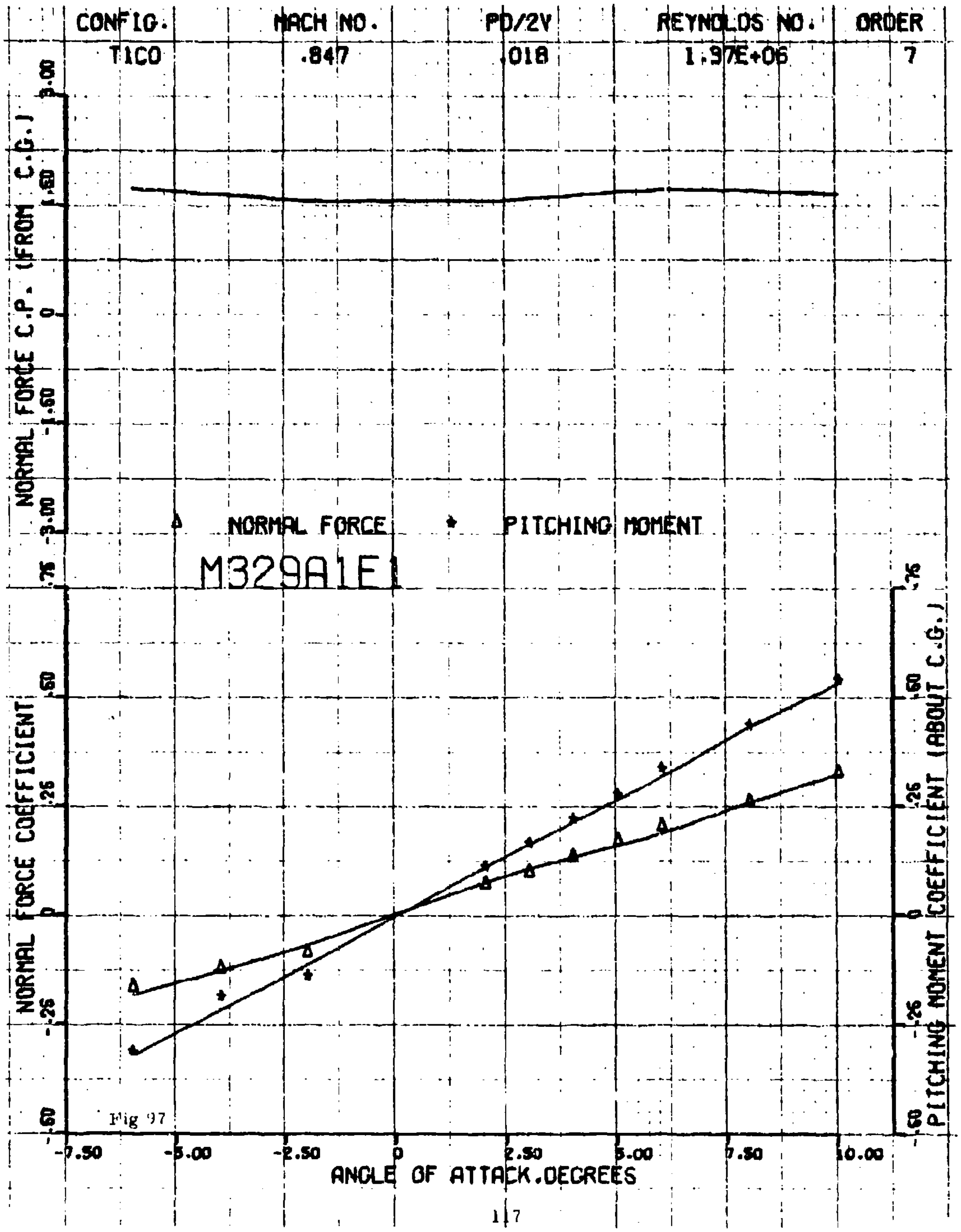

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.847
.018
1.97E+06
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 97

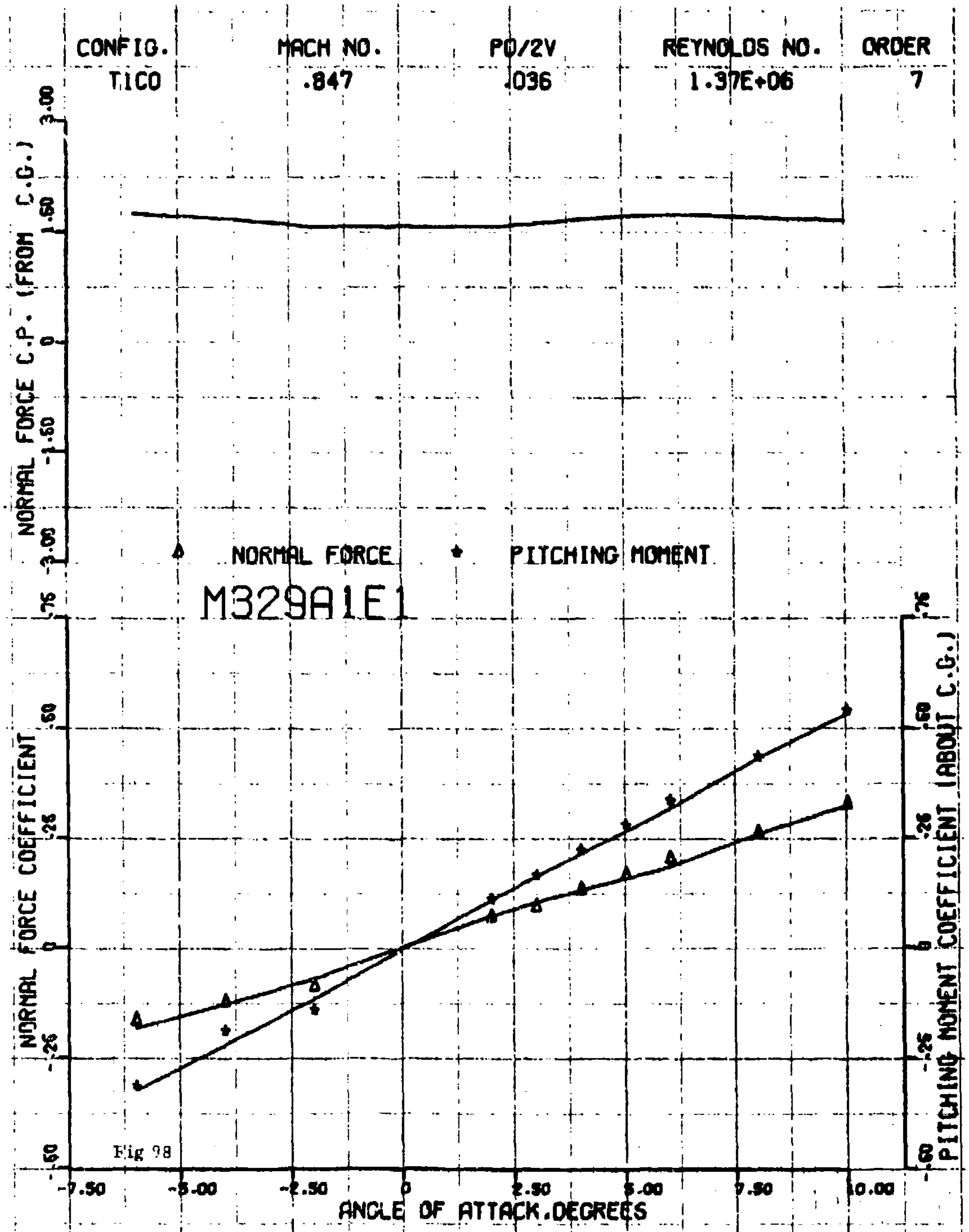

CONFIG.
TICO
MACH NO.
.847
PD/2V
.036
REYNOLDS NO.
1.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 98

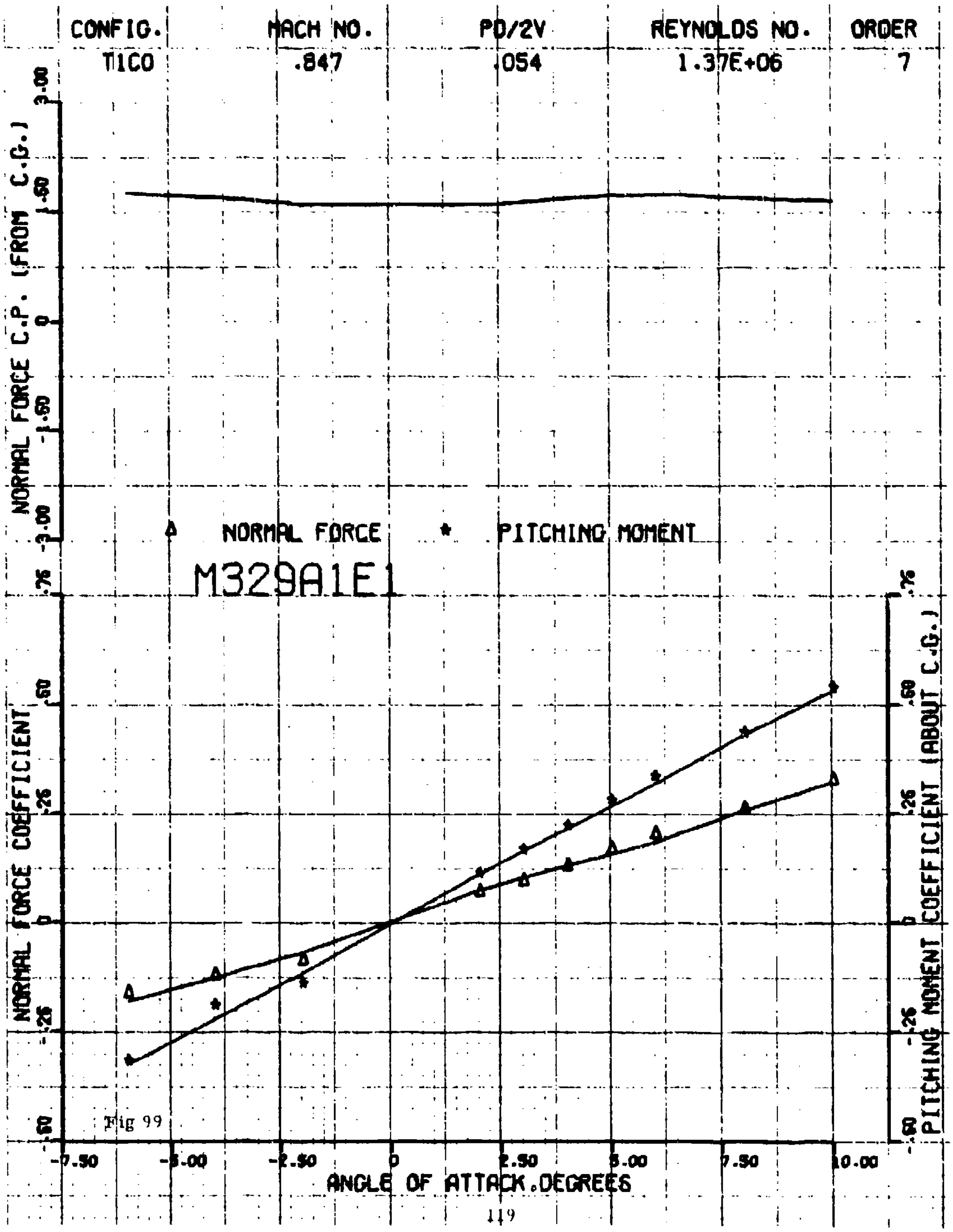
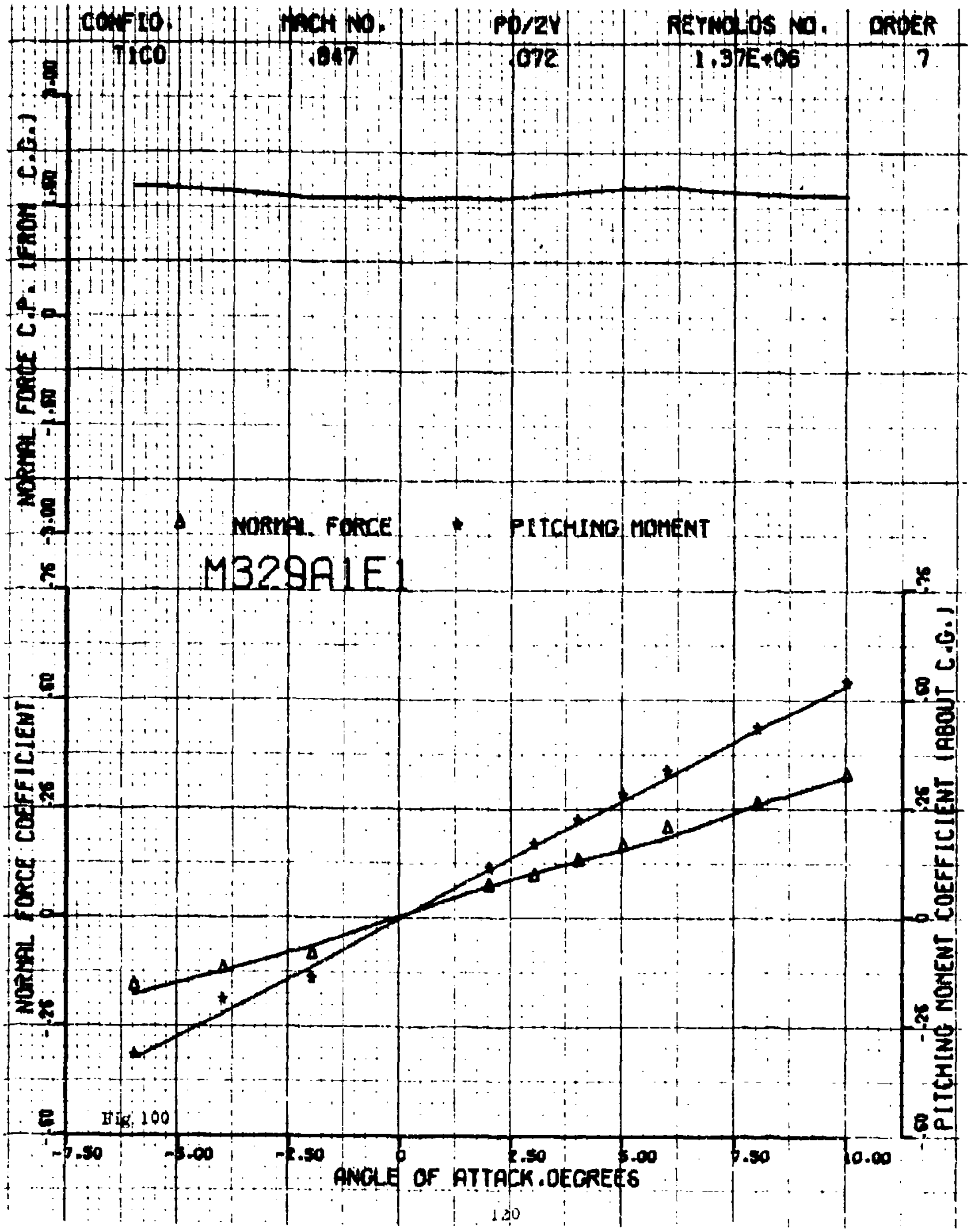
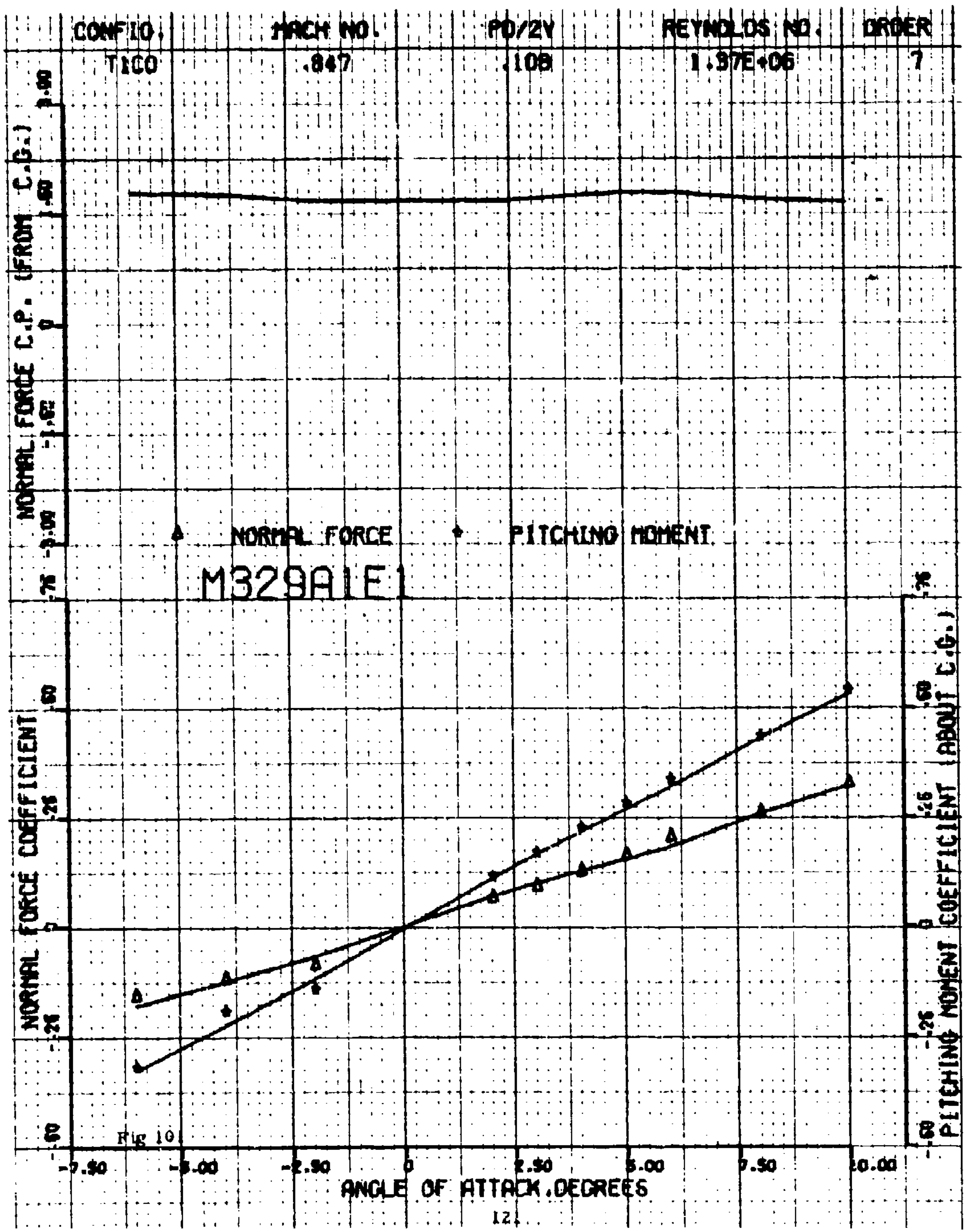

CONFIG. TICO
MACH NO. .847
PD/2V .054
REYNOLDS NO. 1.37E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 99



CONFIG.
TICO
MACH NO.
.847
PD/2V
.072
REYNOLDS NO.
1.37E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig. 100



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C0
.847
.108
1.37E+06
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 10
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

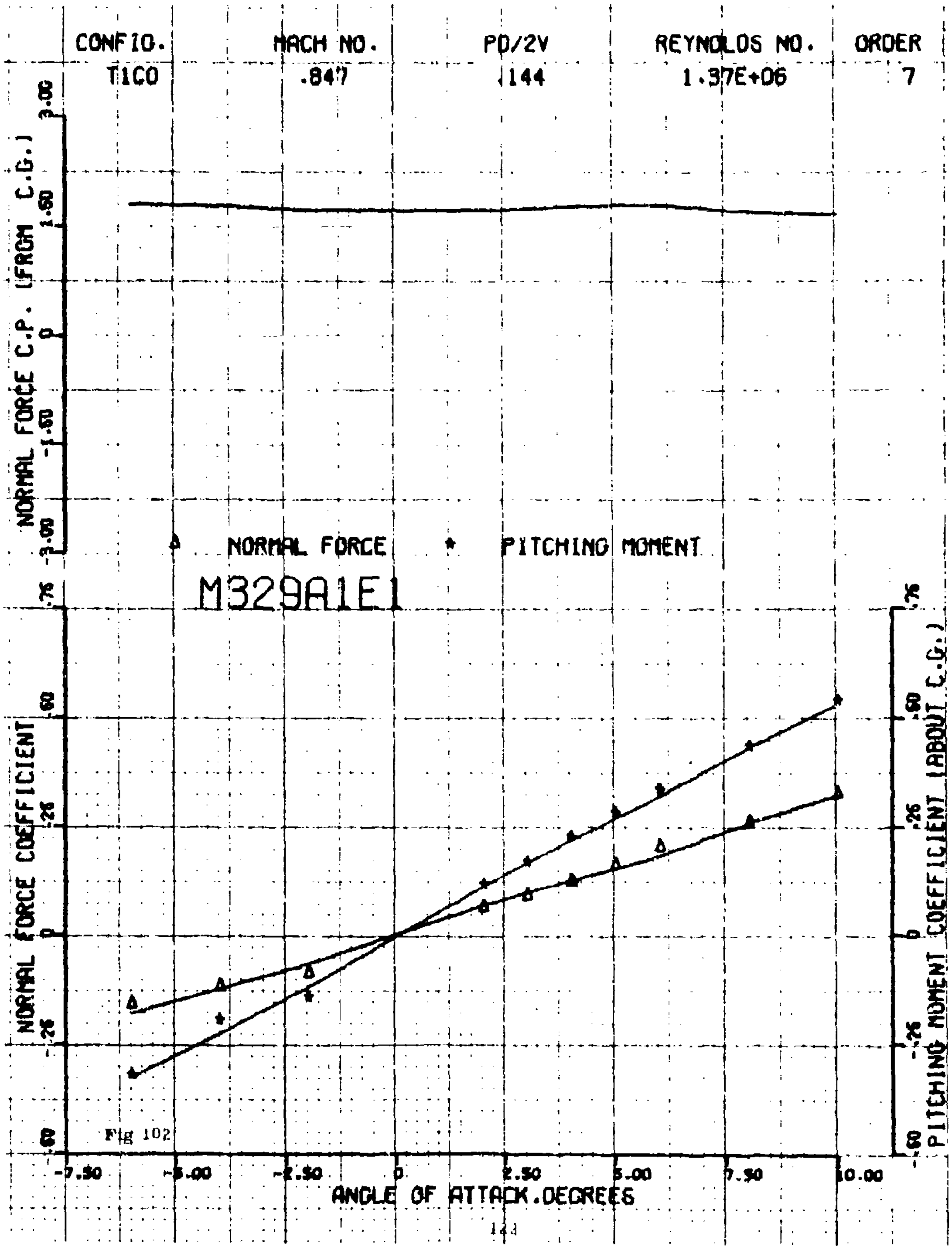

CONFIG. TICO
MACH NO. .847
PD/2V .144
REYNOLDS NO. 1.37E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.75
.50
.25
0
-.25
-.50
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 102

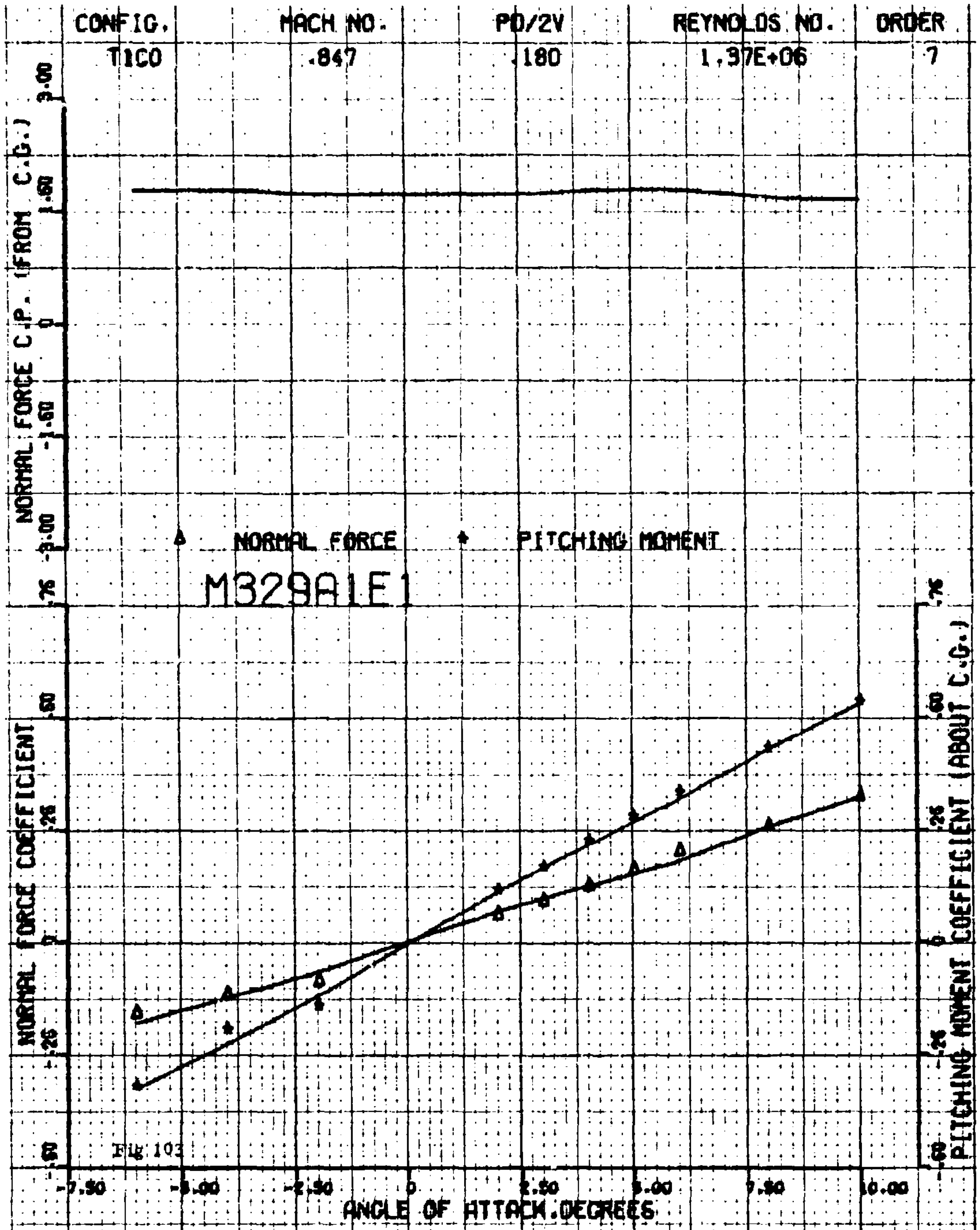

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
TICO .847 .180 1.37E+06 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 103

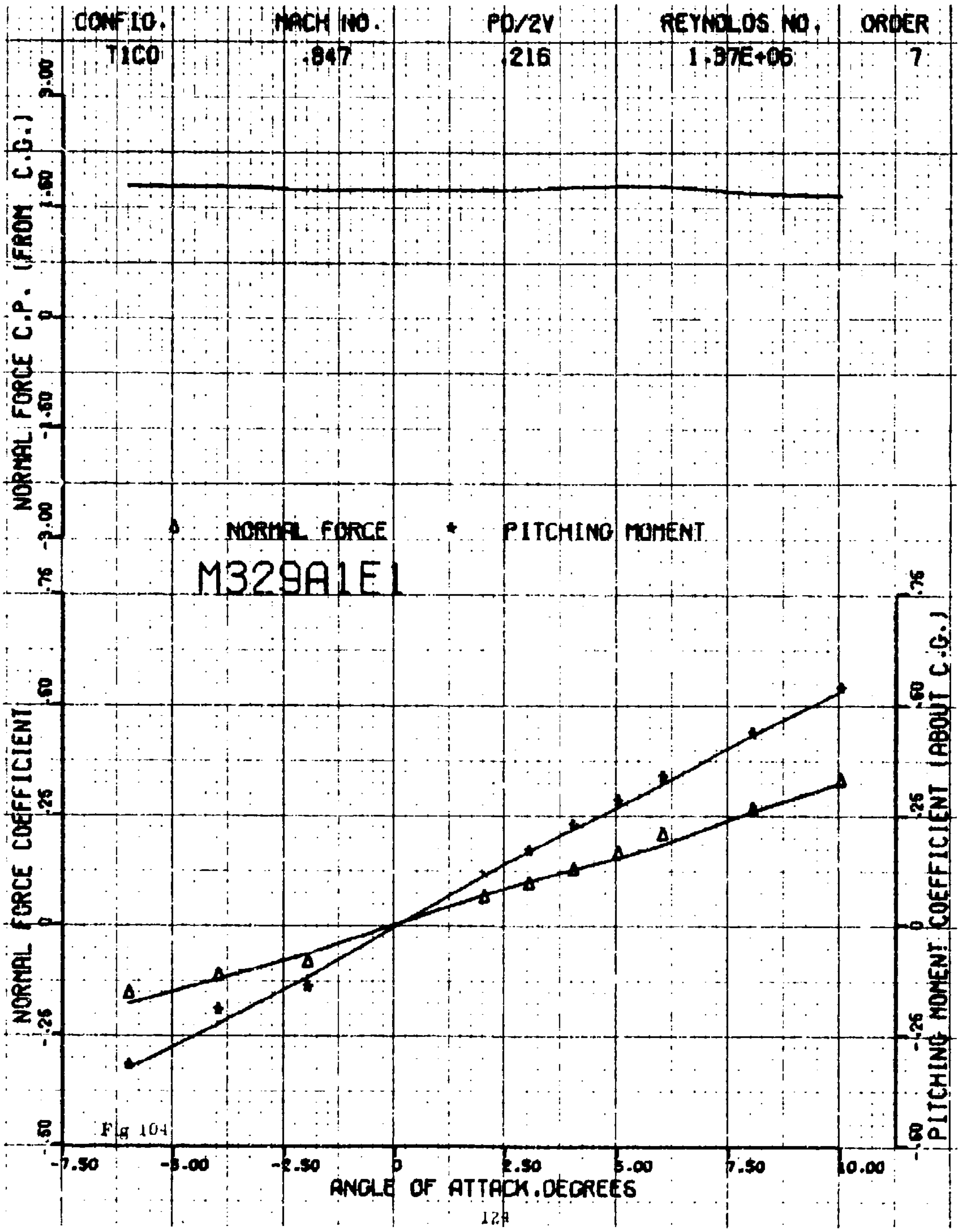
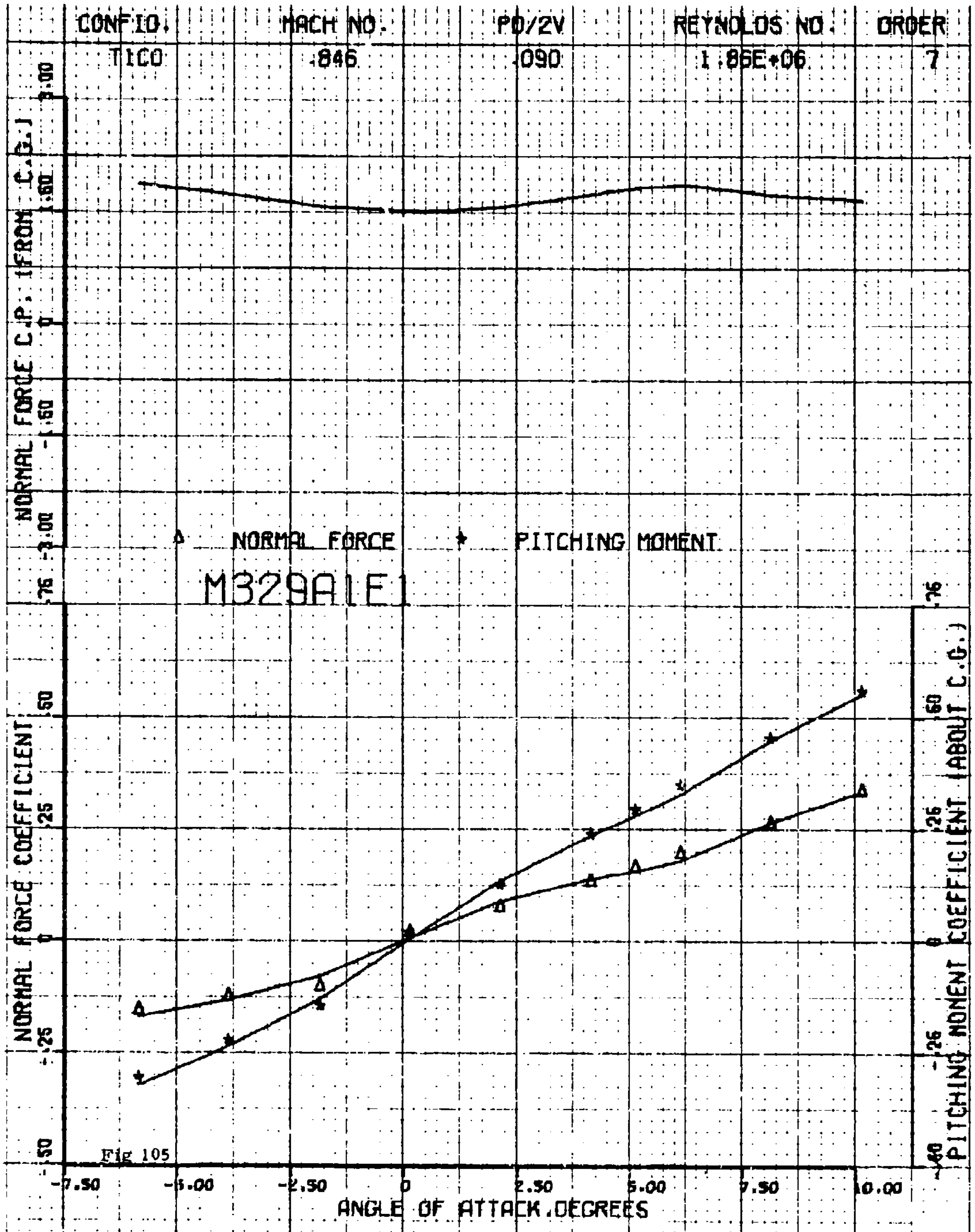
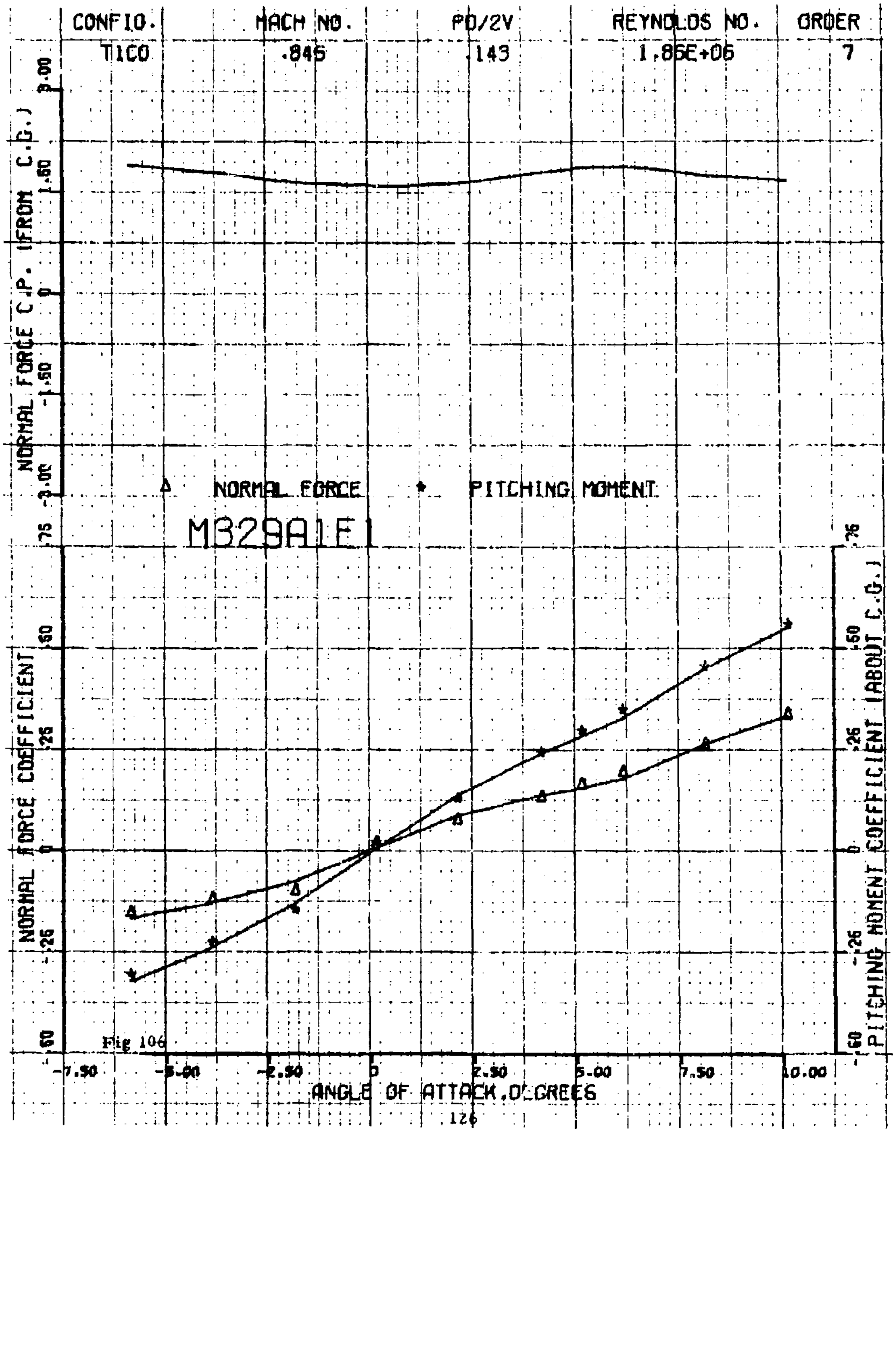
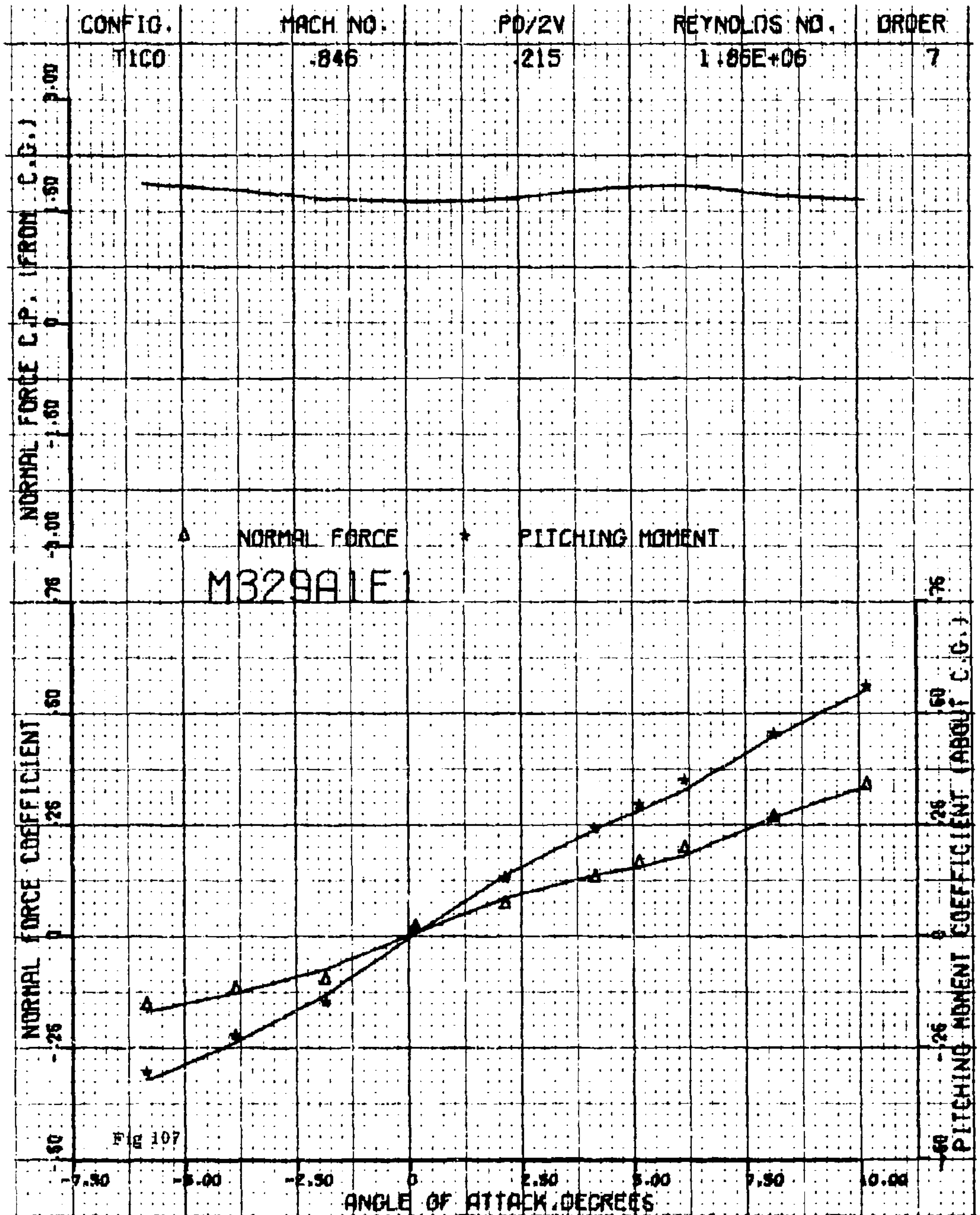

CONFIG. TICO
MACH NO. .847
PD/2V .216
REYNOLDS NO. 1.37E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 104



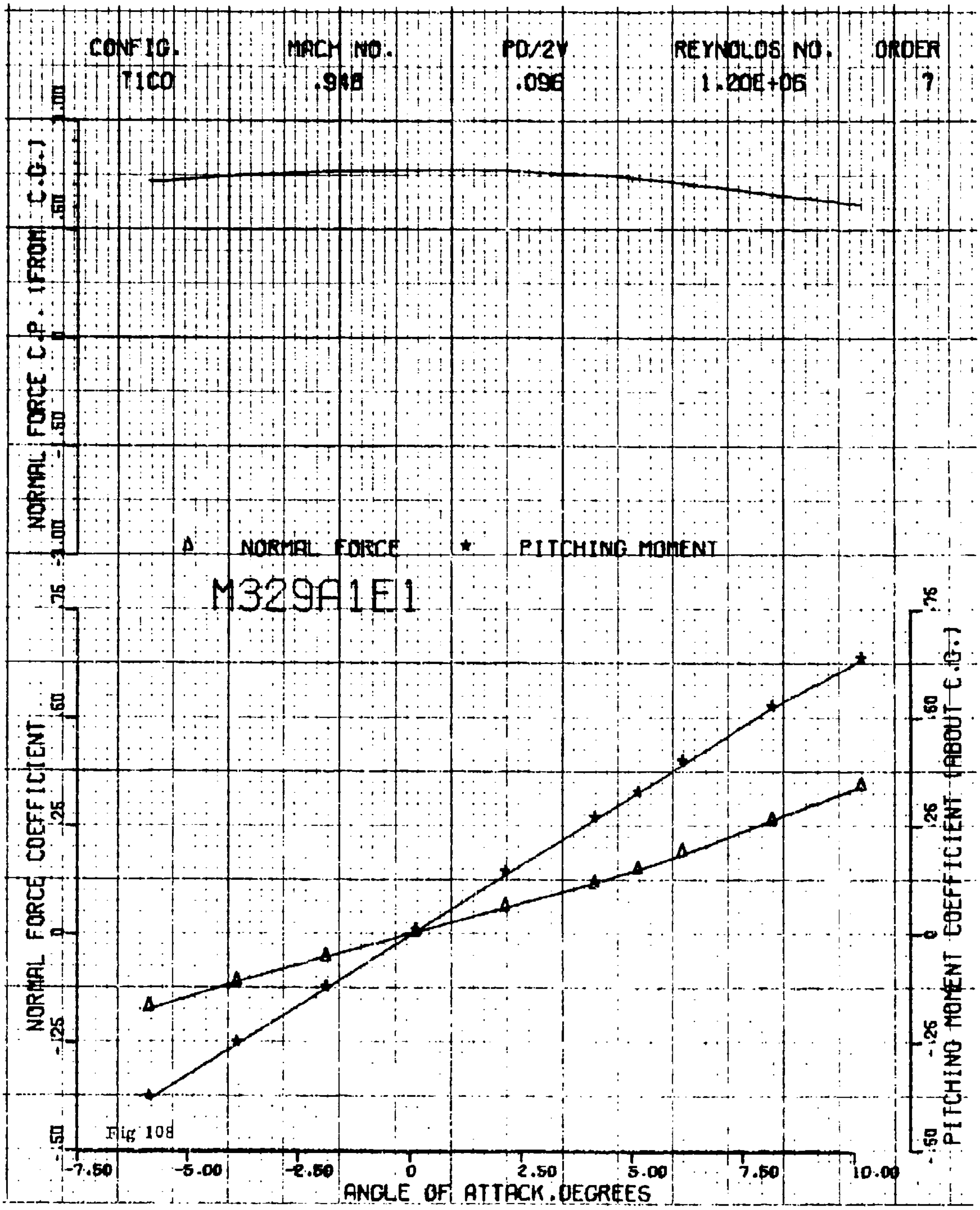
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
TICO .846 .090 1.86E+06 7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 105
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1CO
.845
.143
1.86E+06
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 106



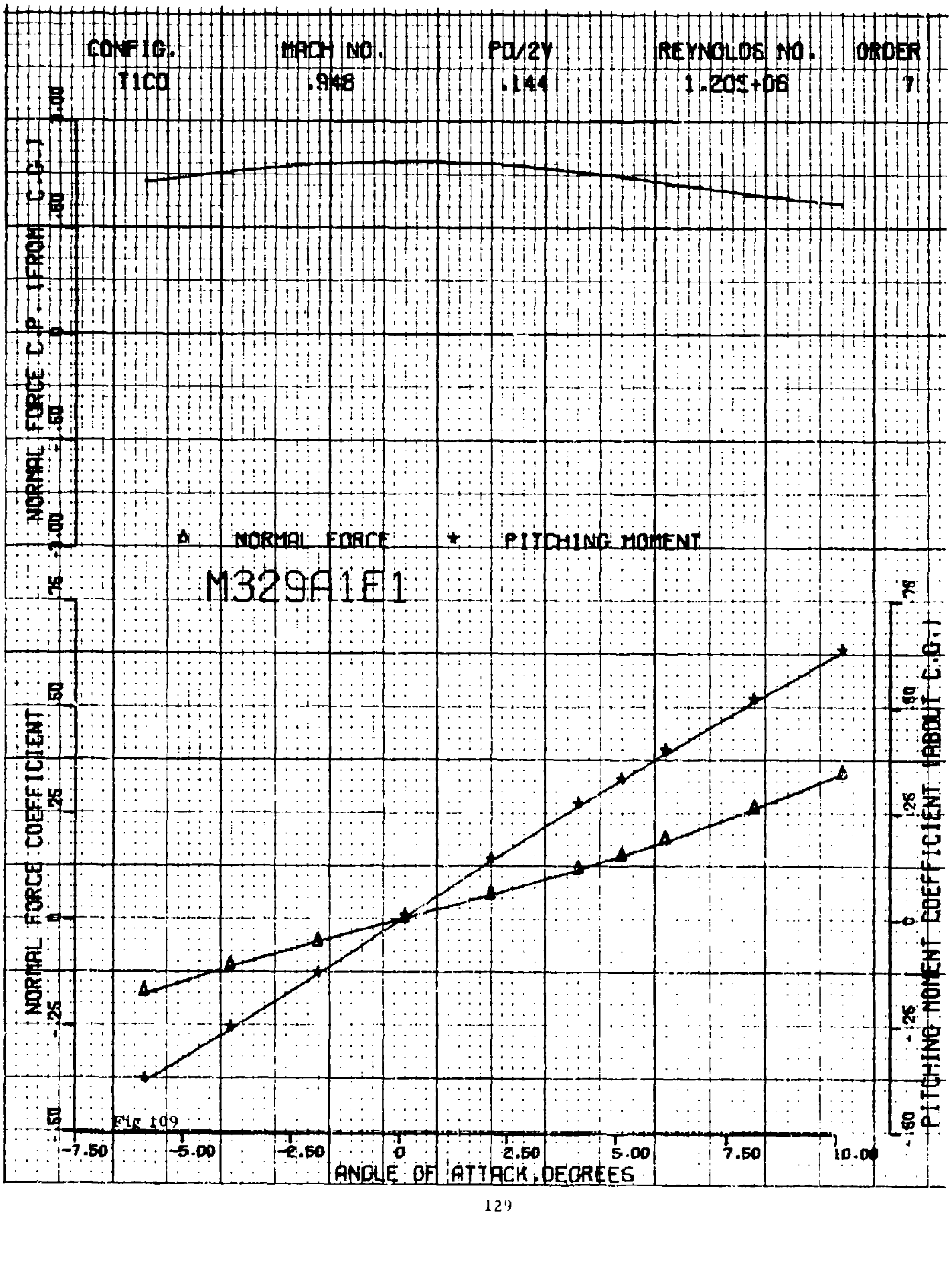
CONFIG.
T1CO
MACH NO.
.846
PD/2V
.215
REYNOLDS NO.
1.86E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

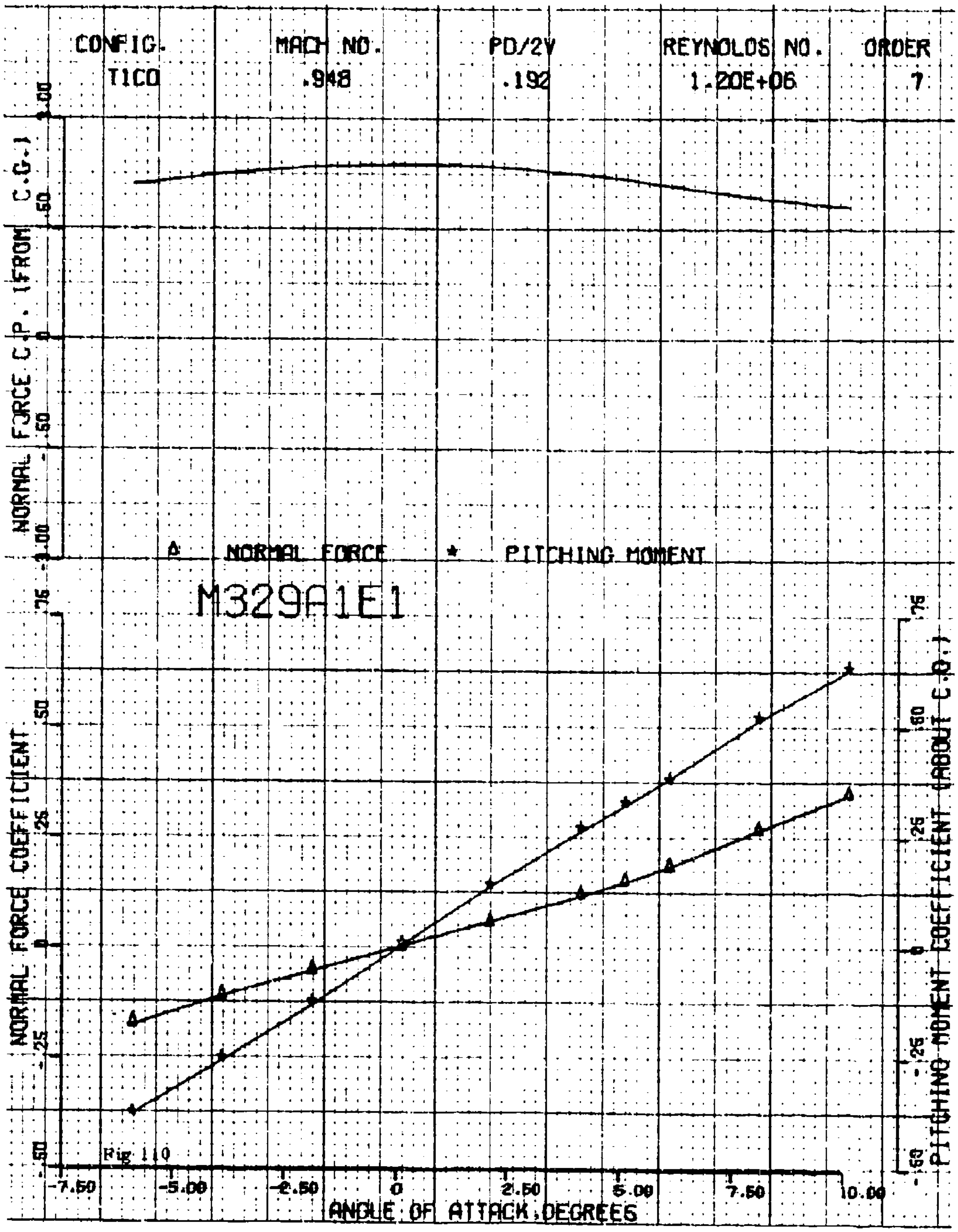
Fig 107



CONFIG.
T1CO
MACH NO.
.948
PD/2V
.096
REYNOLDS NO.
1.20E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
1.00
.50
0
-.50
-1.00
Δ NORMAL FORCE
★ PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 108


CONFIG. T1C0
MACH NO. .948
PD/2V .144
REYNOLDS NO. 1.20E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
Fig 109



CONFIG.
T1CO
MACH NO.
.948
PD/2V
.192
REYNOLDS NO.
1.20E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 110

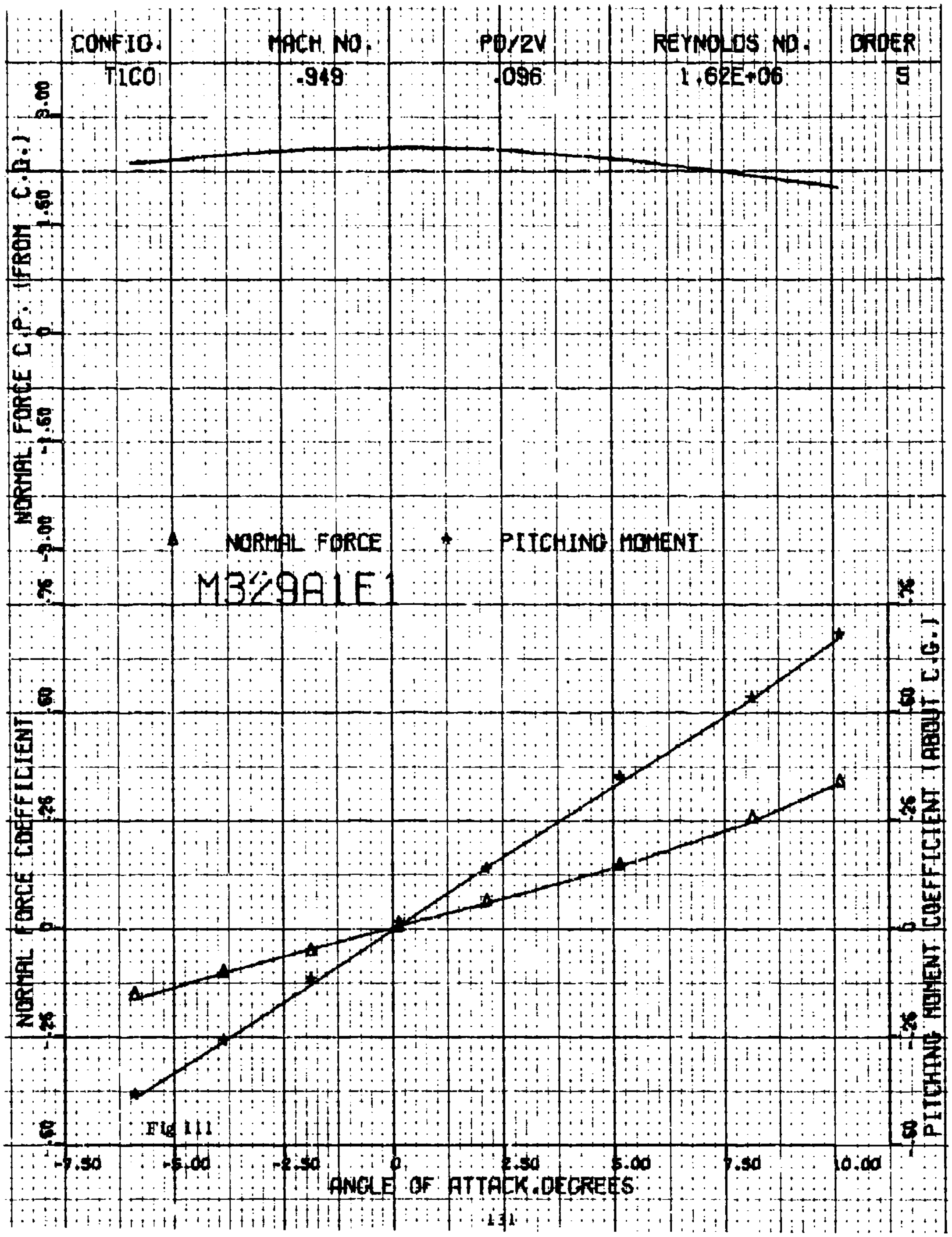
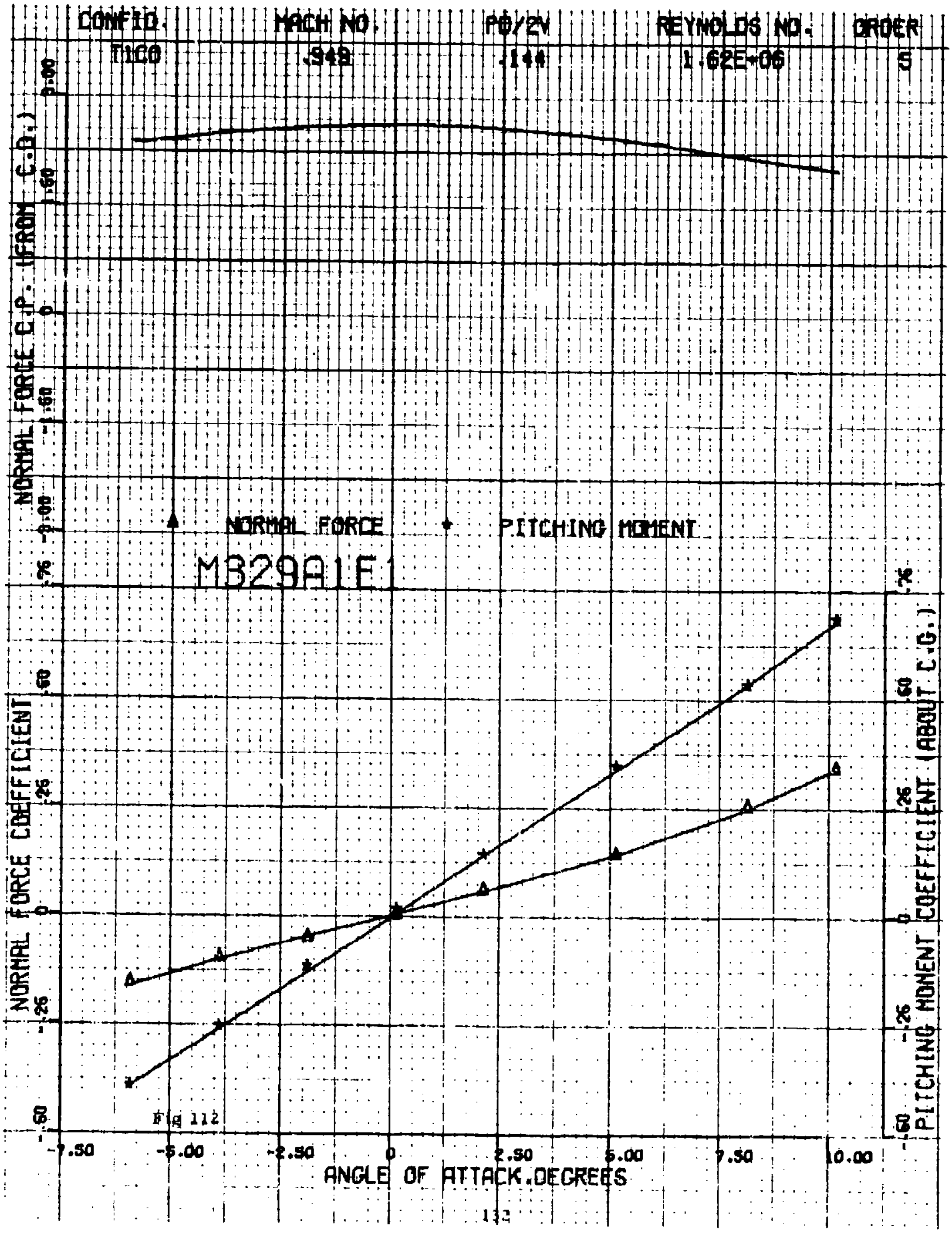
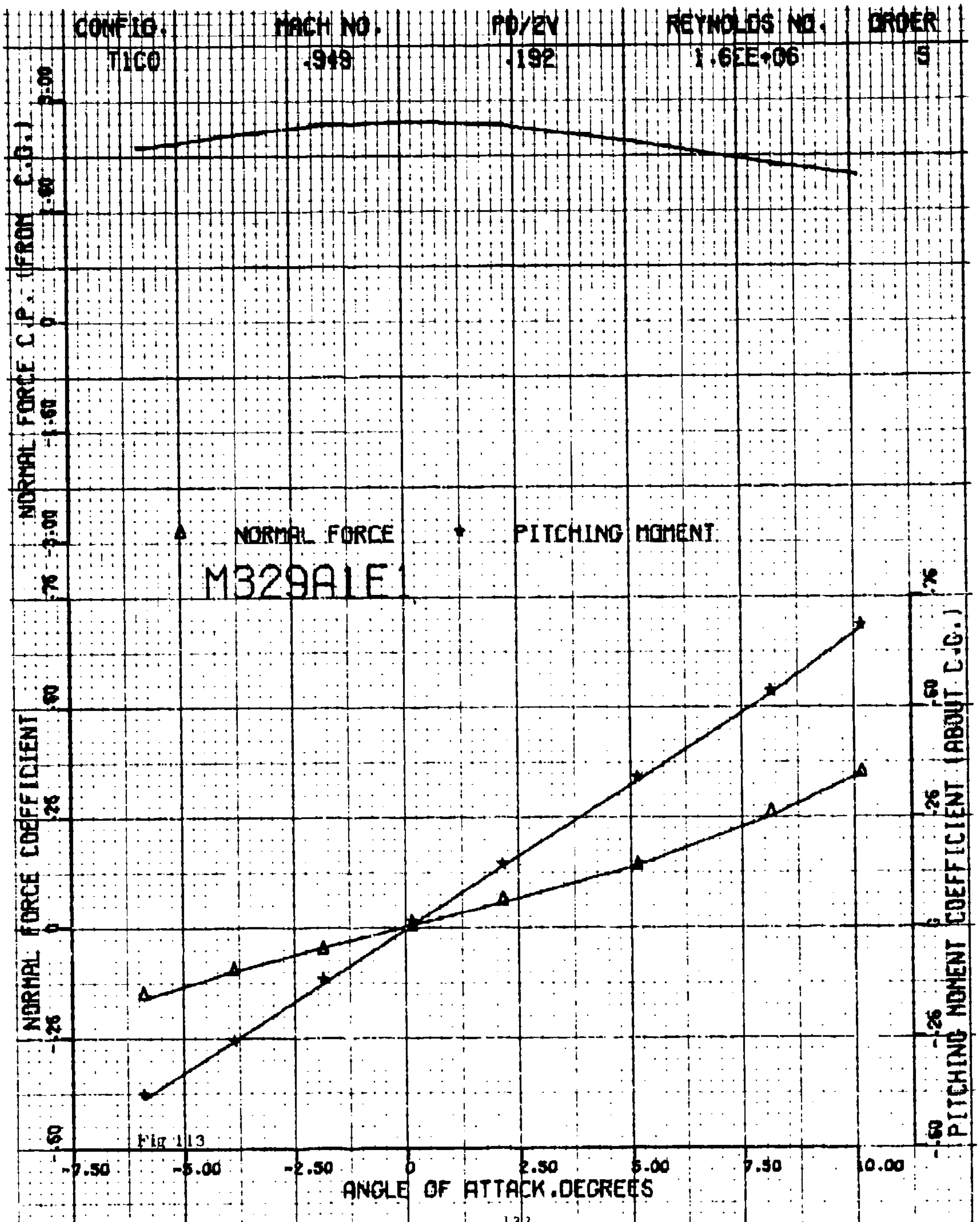

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1CO .949 .096 1.62E+06 5
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 111



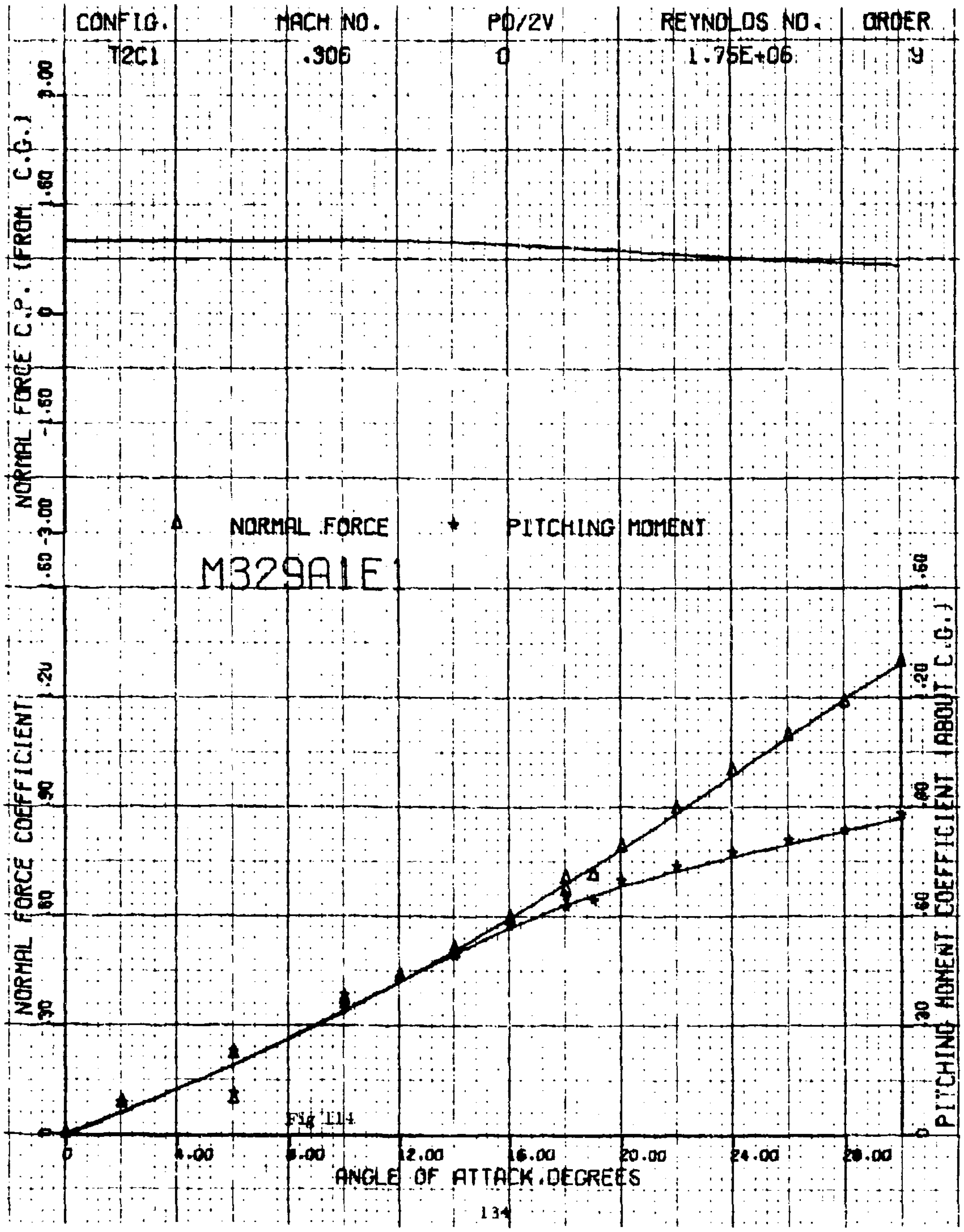
CONFIG.
T1C0
MACH NO.
.948
PD/2V
.144
REYNOLDS NO.
1.62E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 112



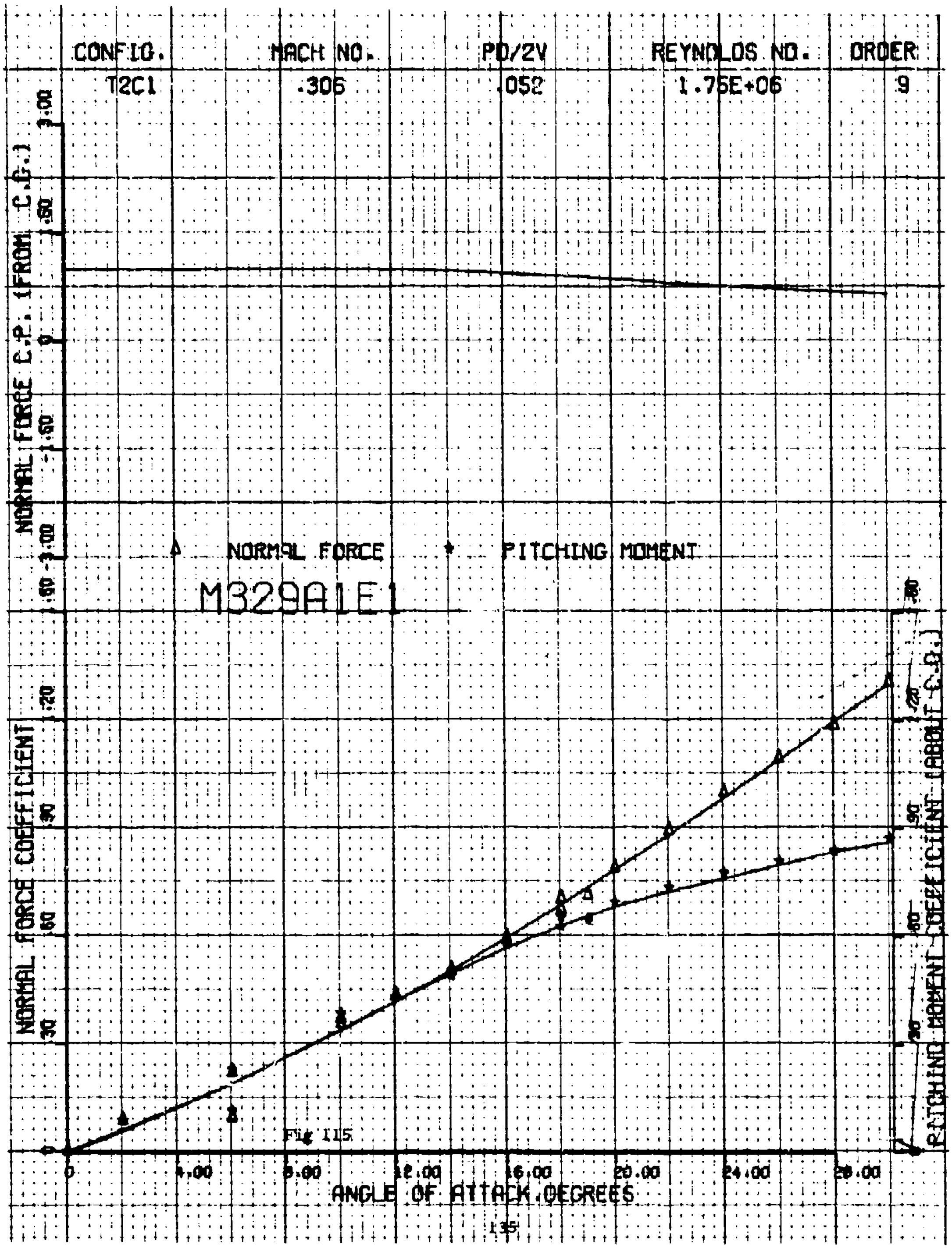
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.949
.192
1.6EE+06
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

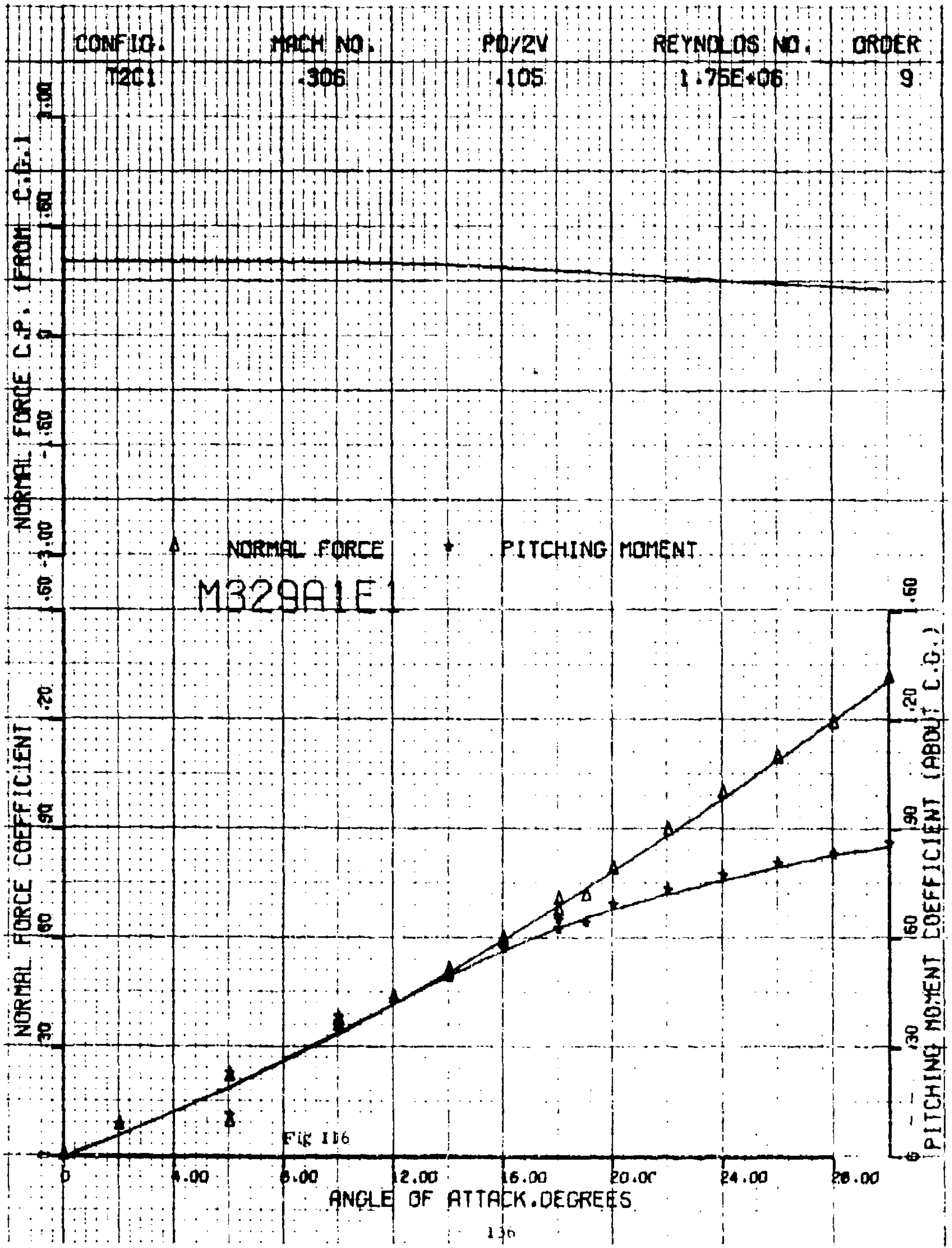
Fig 113



CONFIG.
T2C1
MACH NO.
.306
PD/2V
0
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

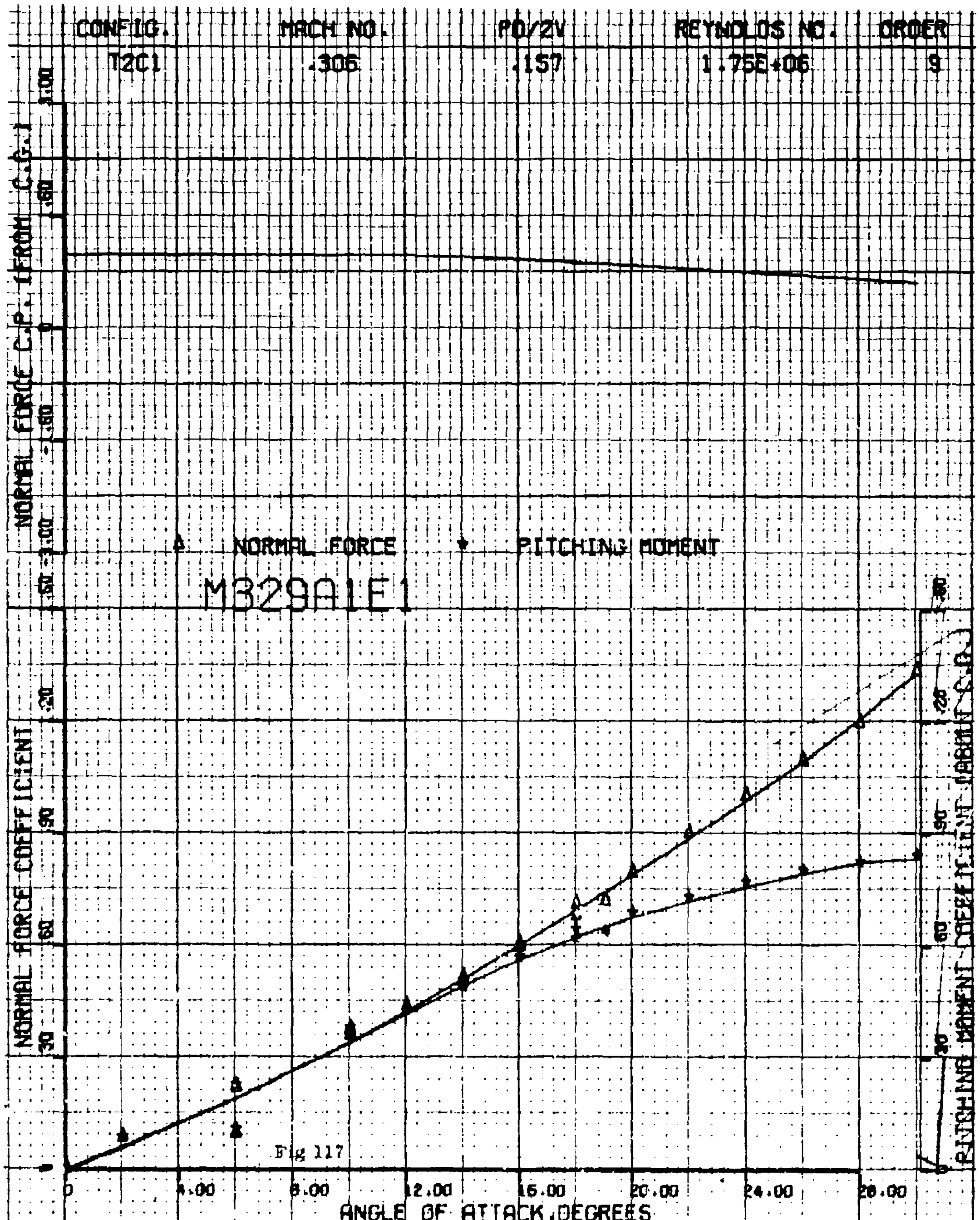
Fig 114


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.306
.052
1.75E+06
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 115
ANGLE OF ATTACK,DEGREES



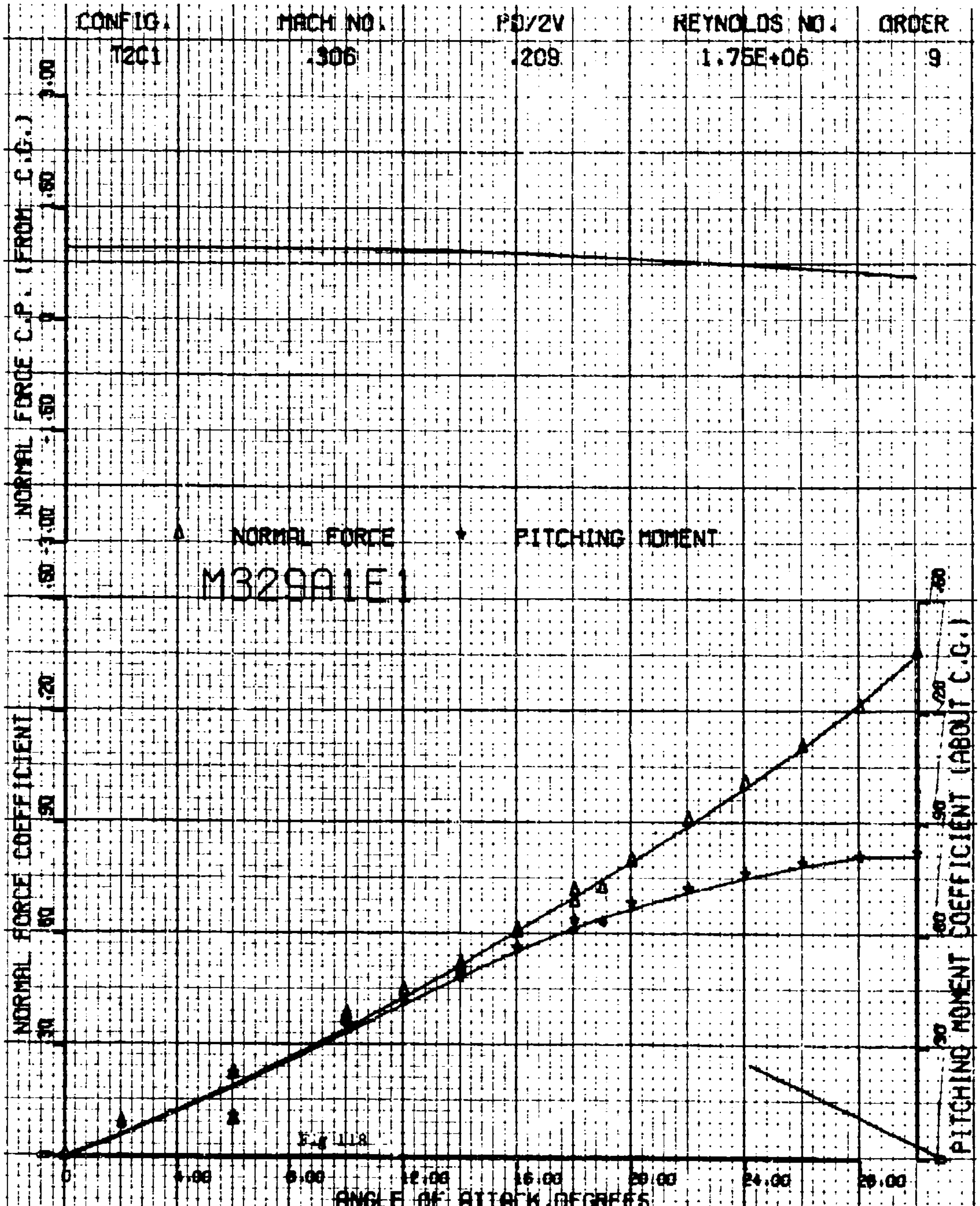
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T2C1 .306 .105 1.75E+06 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
0 4.00 8.00 12.00 16.00 20.00 24.00 28.00

Fig 116



CONFIG.
T2C1
MACH NO.
.306
PD/2V
.157
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00
ANGLE OF ATTACK,DEGREES

Fig 117


CONFIG.
T2C1
MACH NO.
.306
PD/2V
.209
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

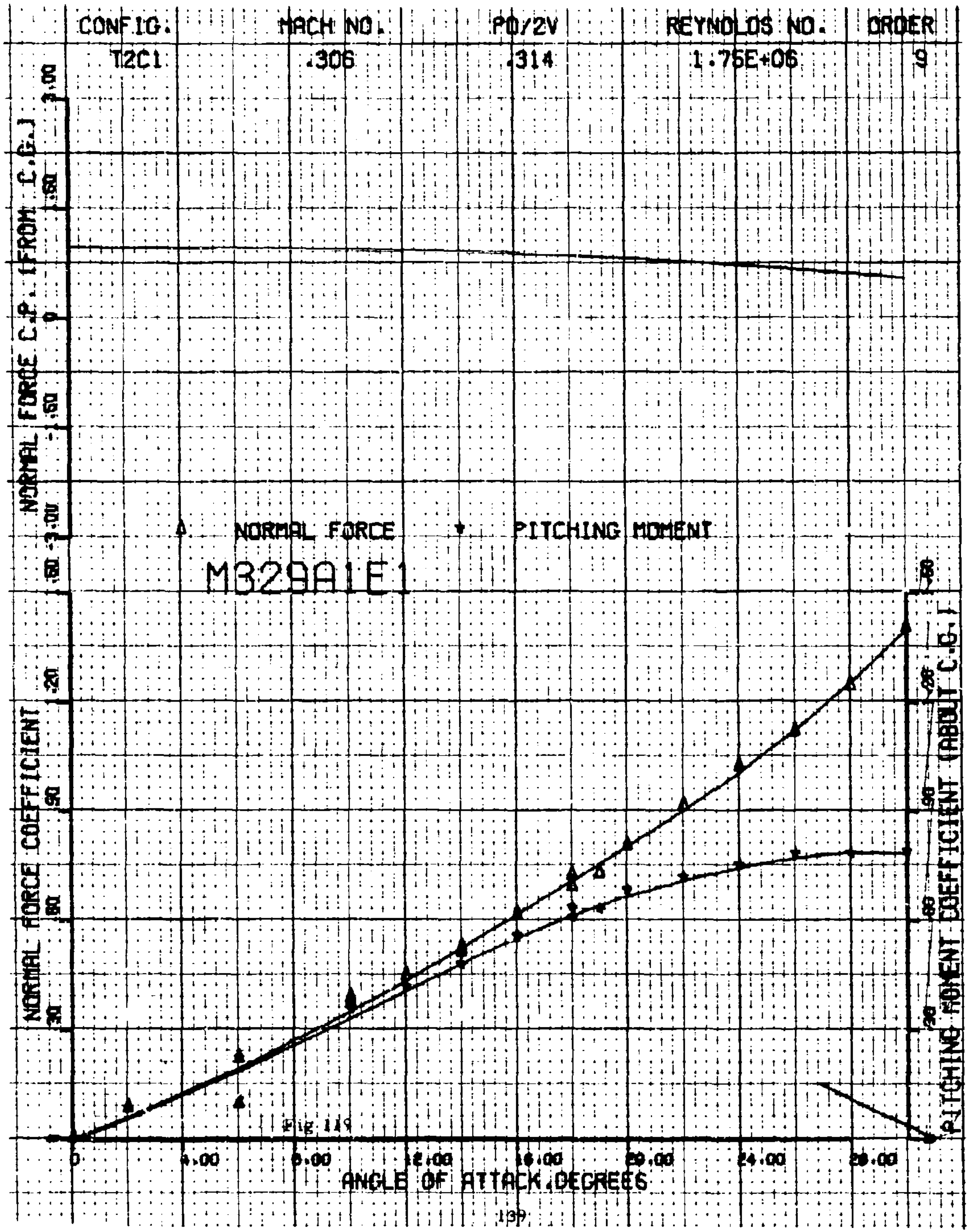
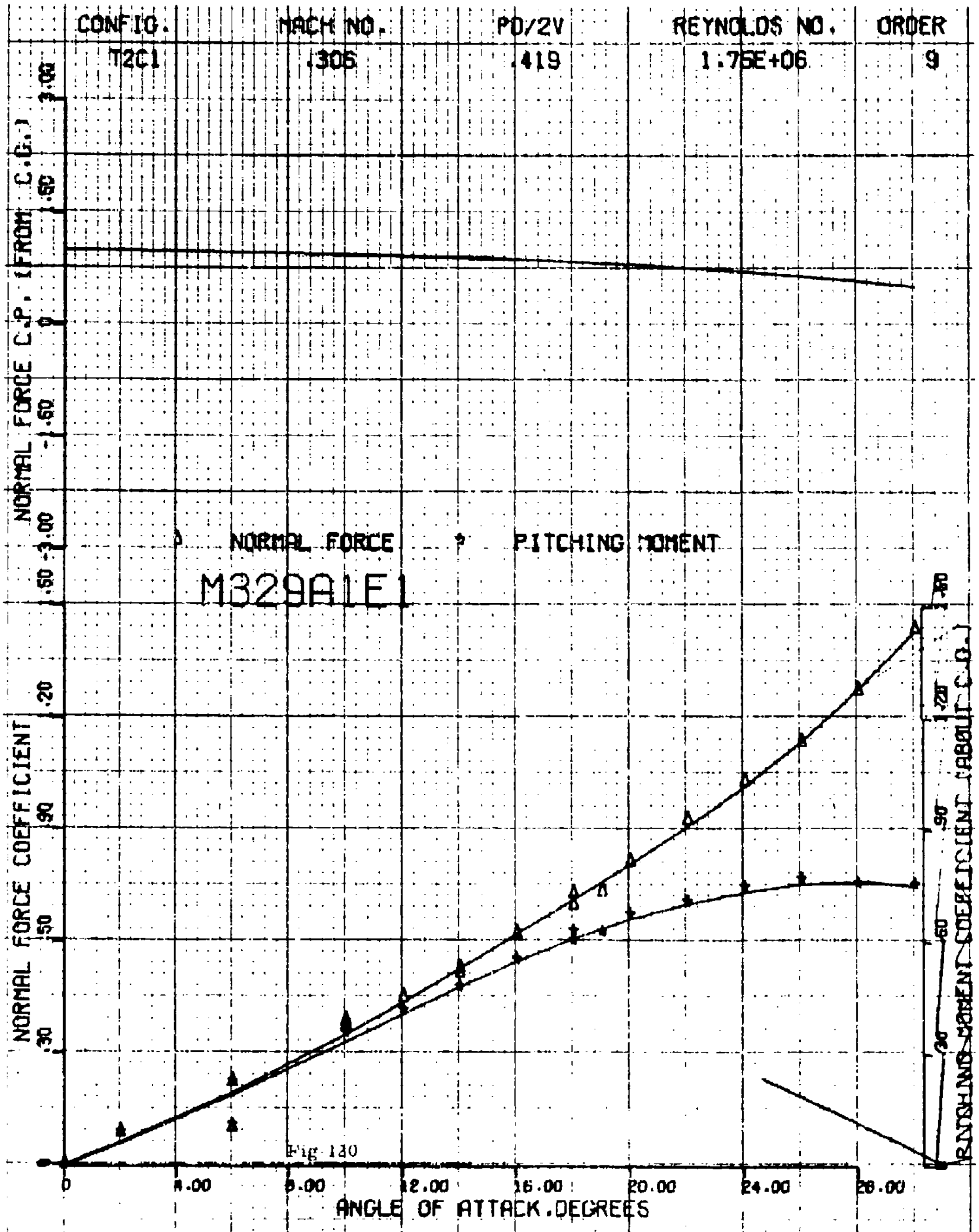
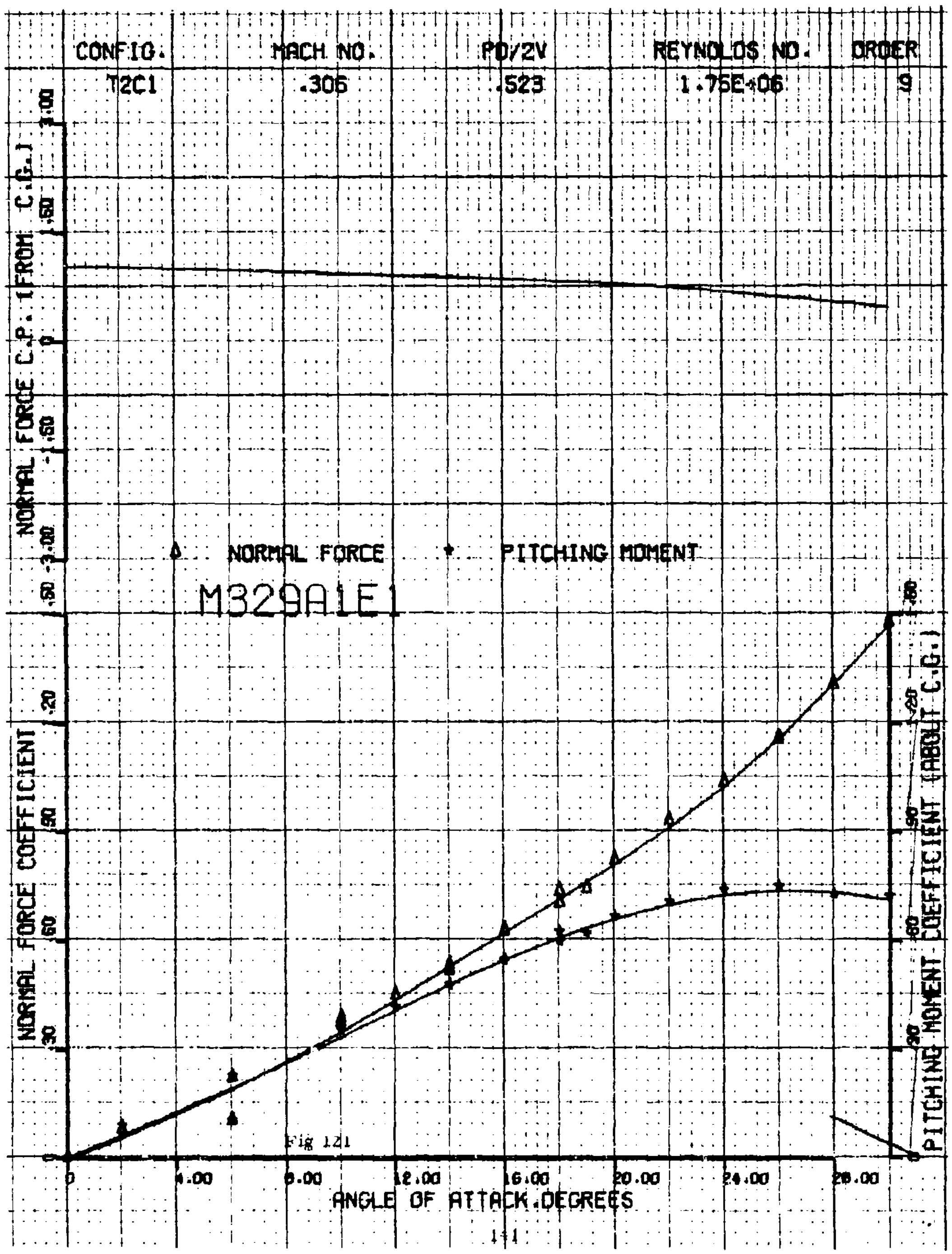

CONFIG. T2C1
MACH NO. .306
PD/2V .314
REYNOLDS NO. 1.75E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00

Fig 119



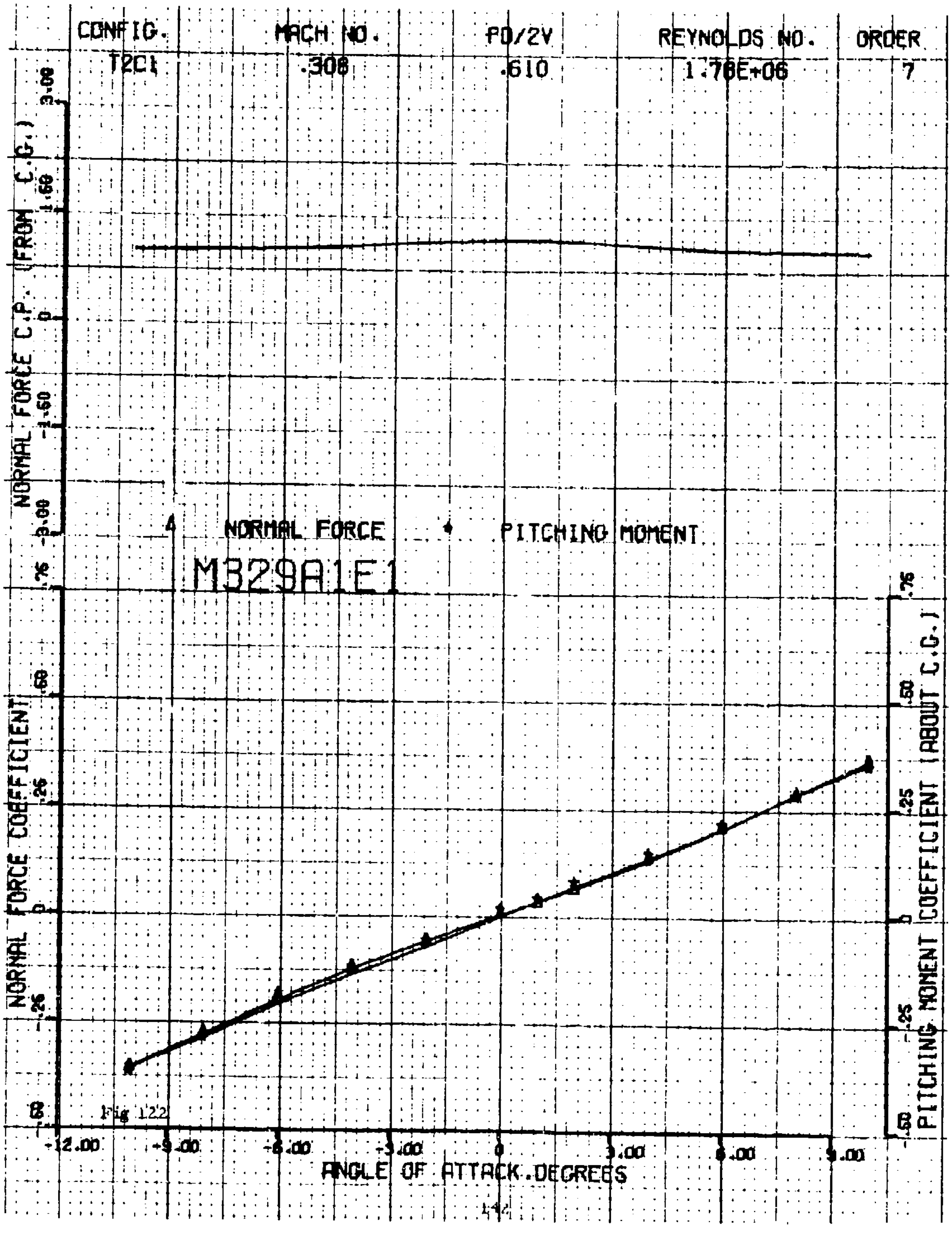
CONFIG.
T2C1
MACH NO.
.306
PD/2V
.419
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 130



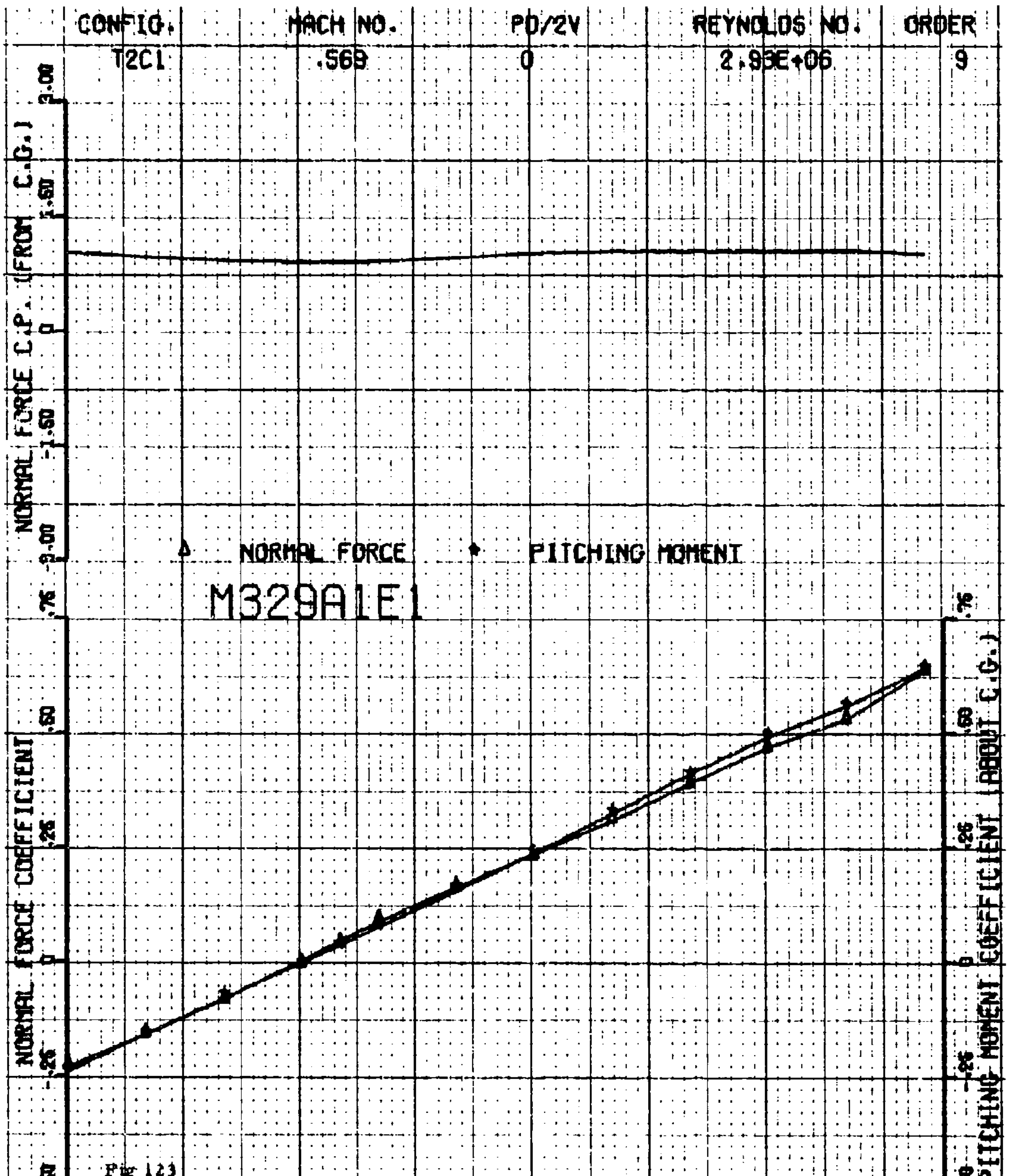
CONFIG.
T2C1
MACH NO.
.306
PD/2V
.523
REYNOLDS NO.
1.75E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 121



CONFIG.
T2C1
MACH NO.
.308
PD/2V
.610
REYNOLDS NO.
1.76E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
ANGLE OF ATTACK, DEGREES

Fig 122



CONFIG. T2C1
MACH NO. .569
PD/2V 0
REYNOLDS NO. 2.95E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 123

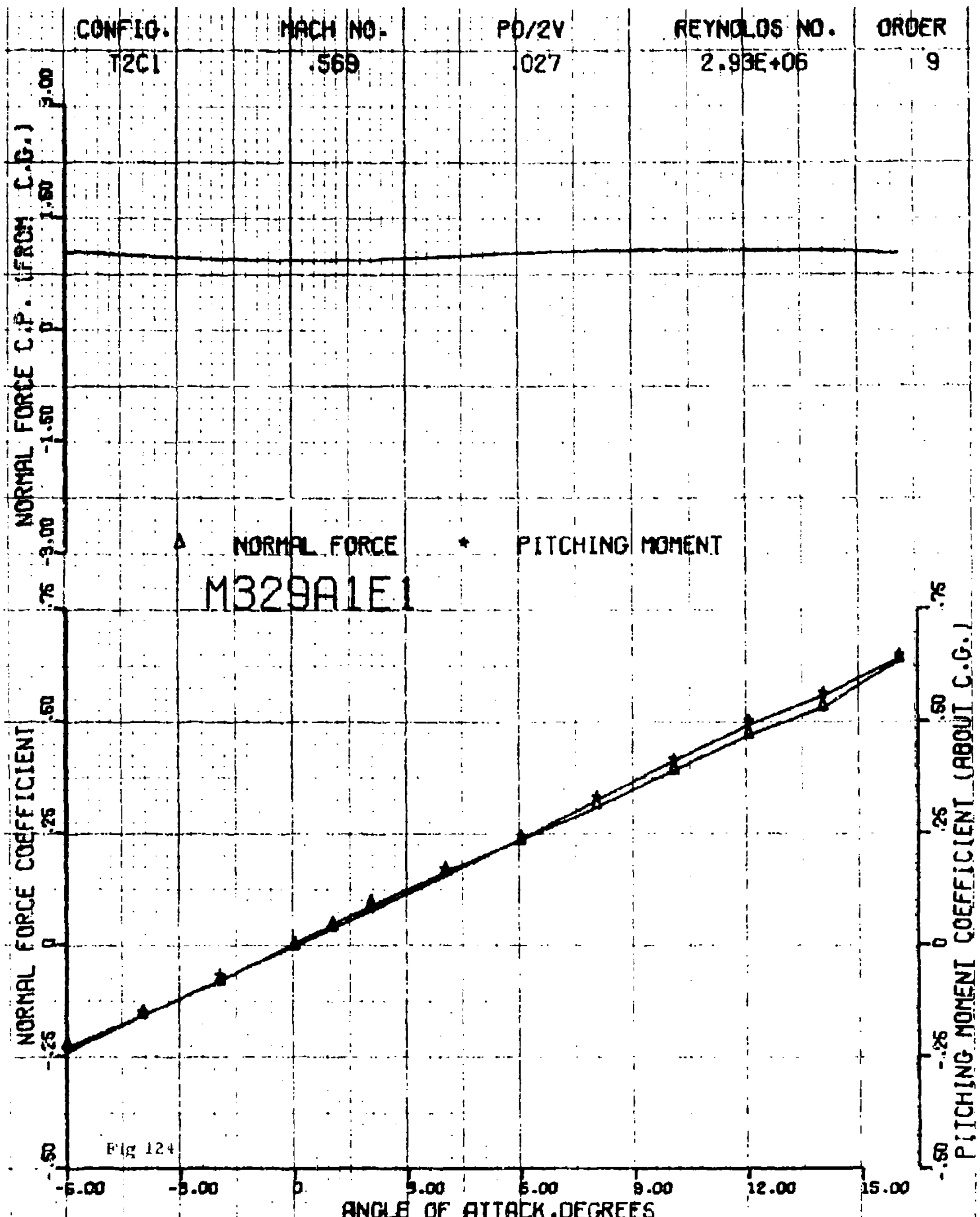
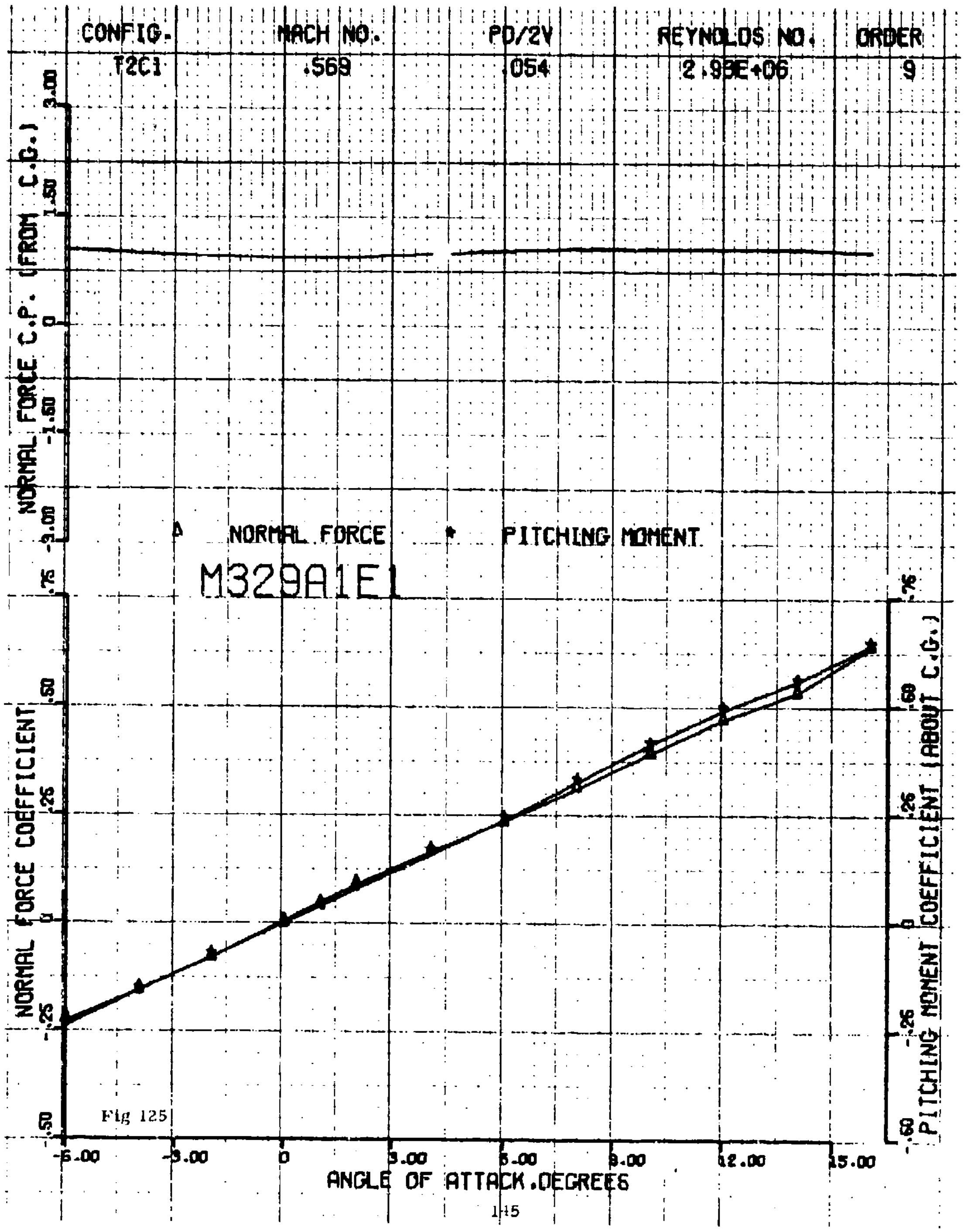
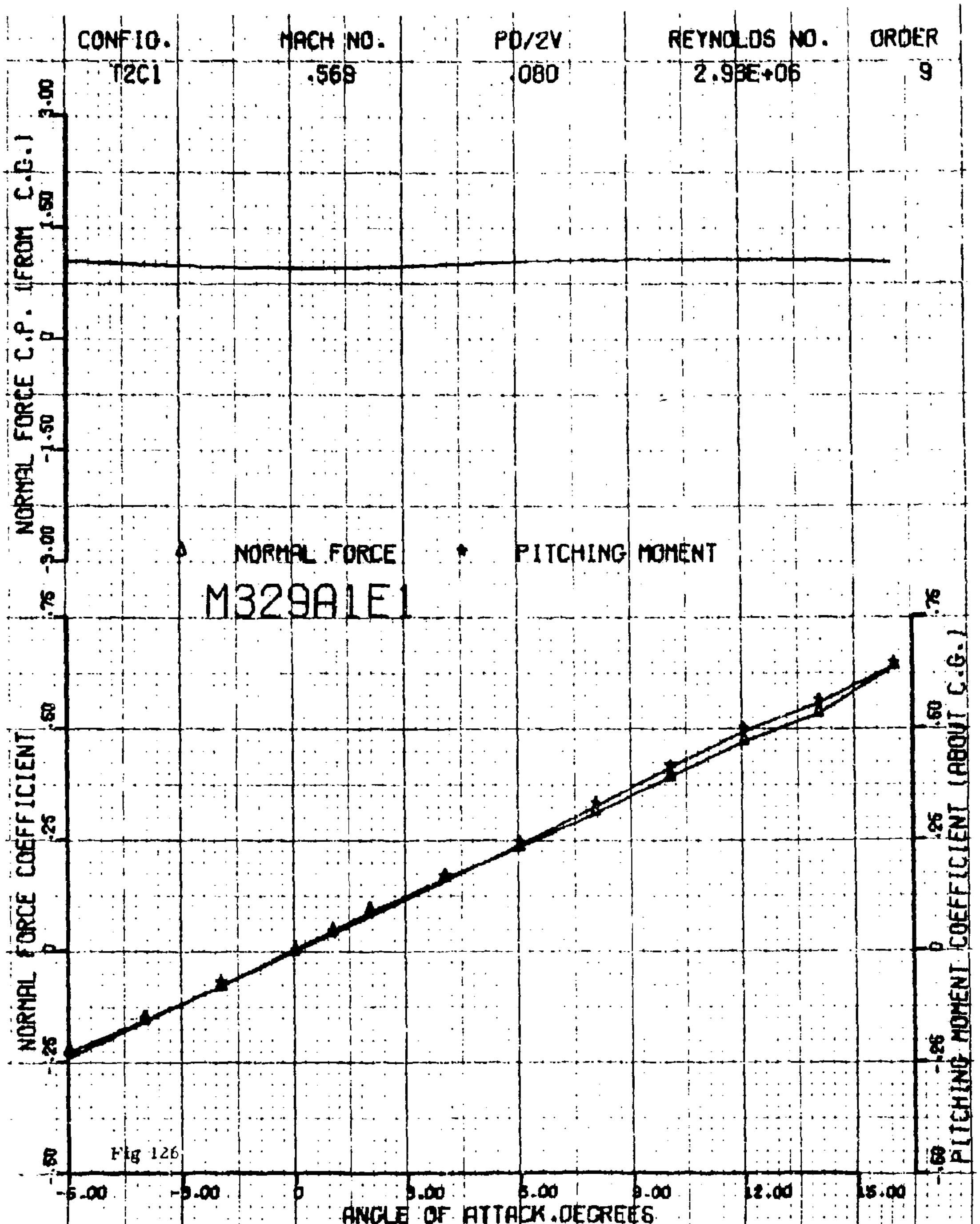

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.569
.027
2.93E+06
9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES

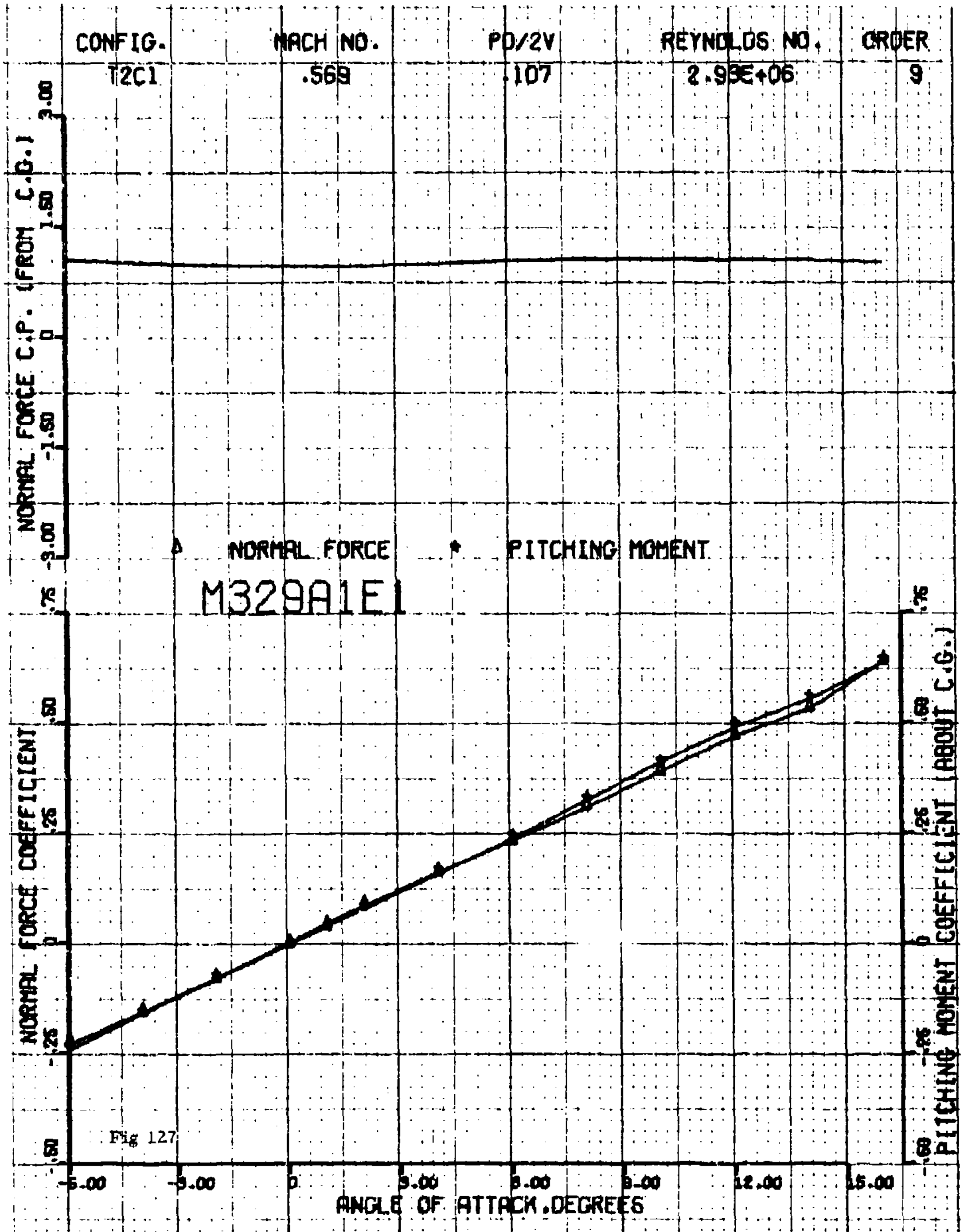
Fig 124


CONFIG.
T2C1
MACH NO.
.569
PD/2V
.054
REYNOLDS NO.
2.95E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES
Fig 125



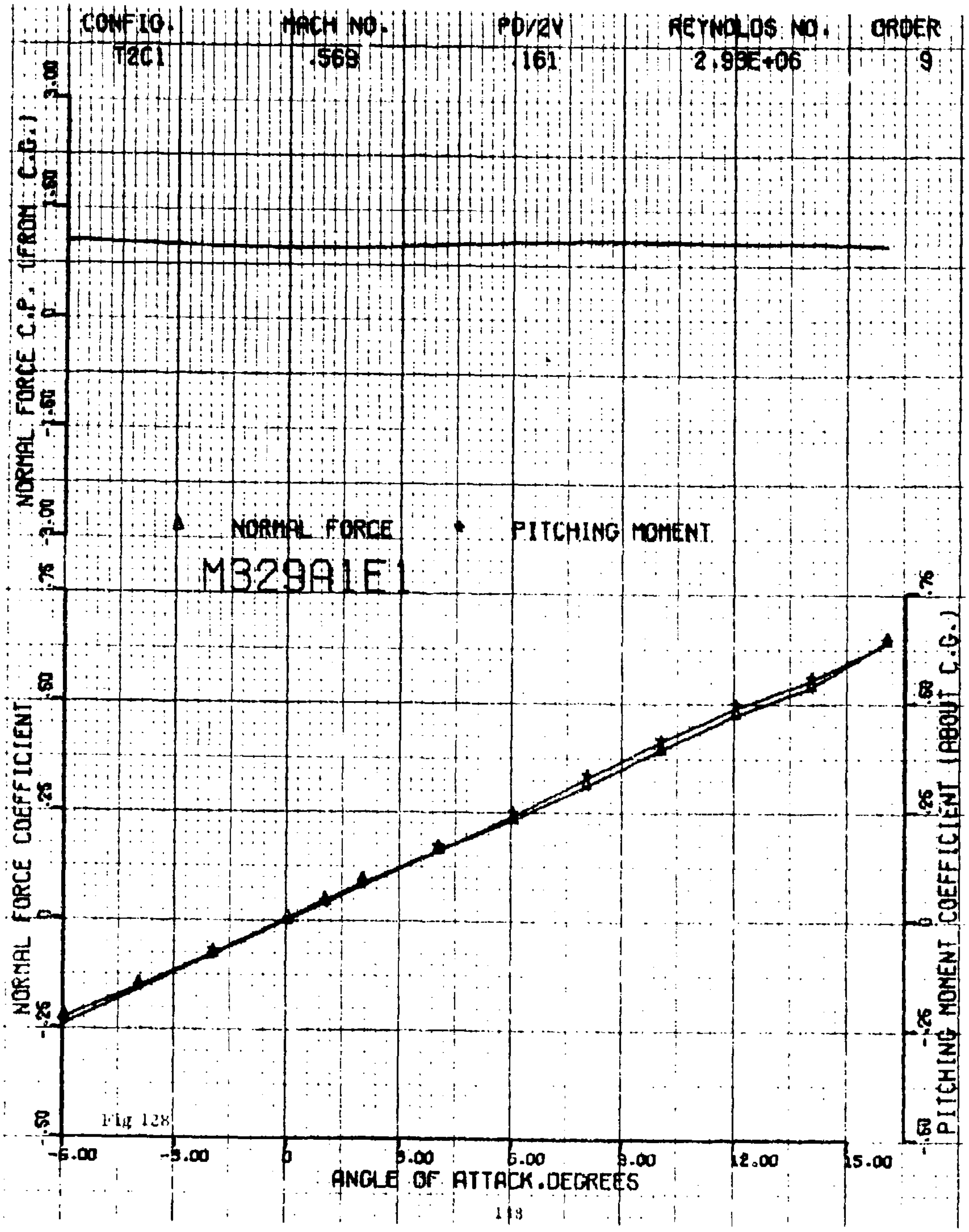
CONFIG.
T2C1
MACH NO.
.568
PD/2V
.080
REYNOLDS NO.
2.93E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

Fig 126



CONFIG.
T2C1
MACH NO.
.569
PD/2V
.107
REYNOLDS NO.
2.93E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.75
.50
.25
0
-.25
-.50
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES

Fig 127



CONFIG.
T2C1
MACH NO.
.568
PD/2V
161
REYNOLDS NO.
2.93E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 128

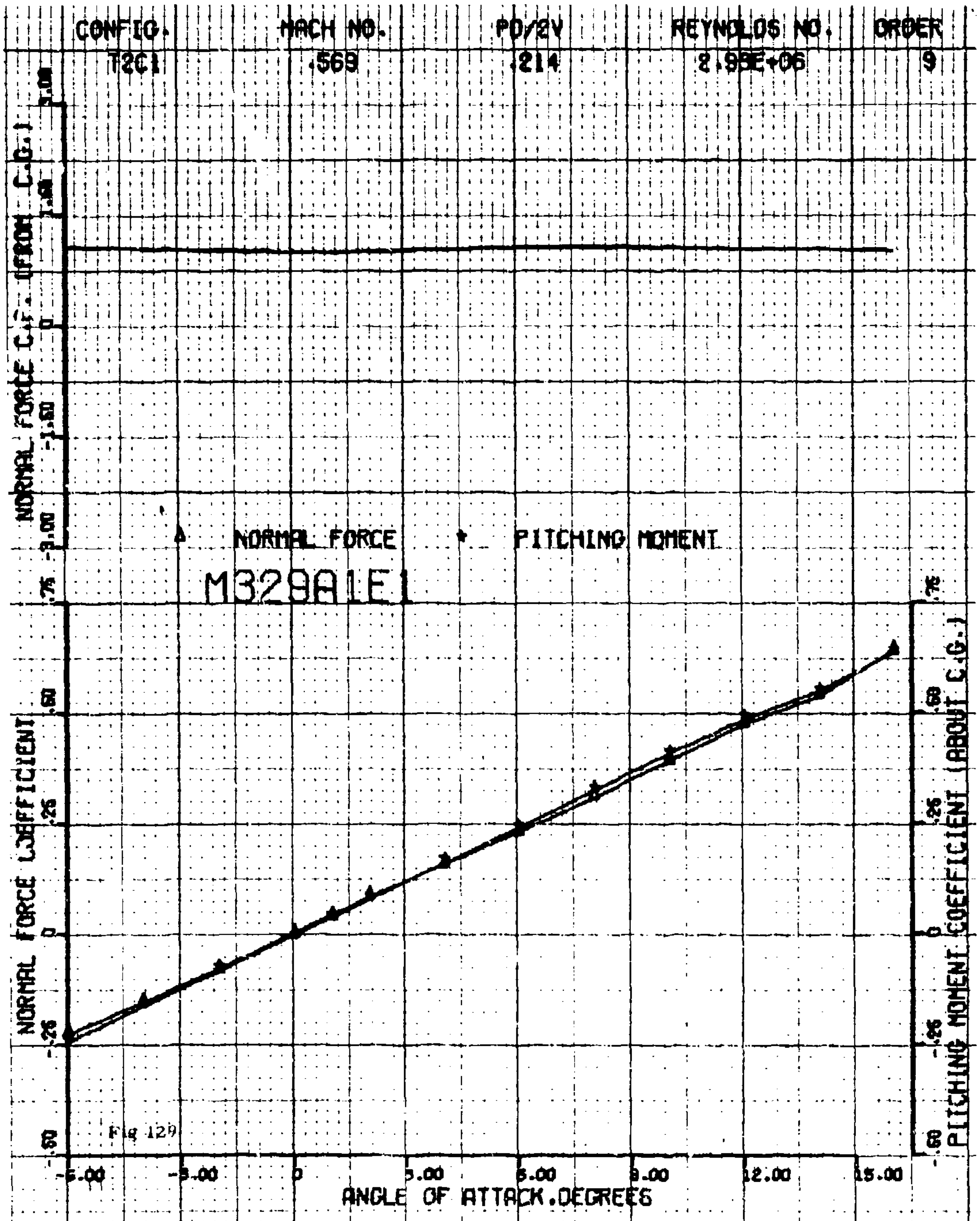
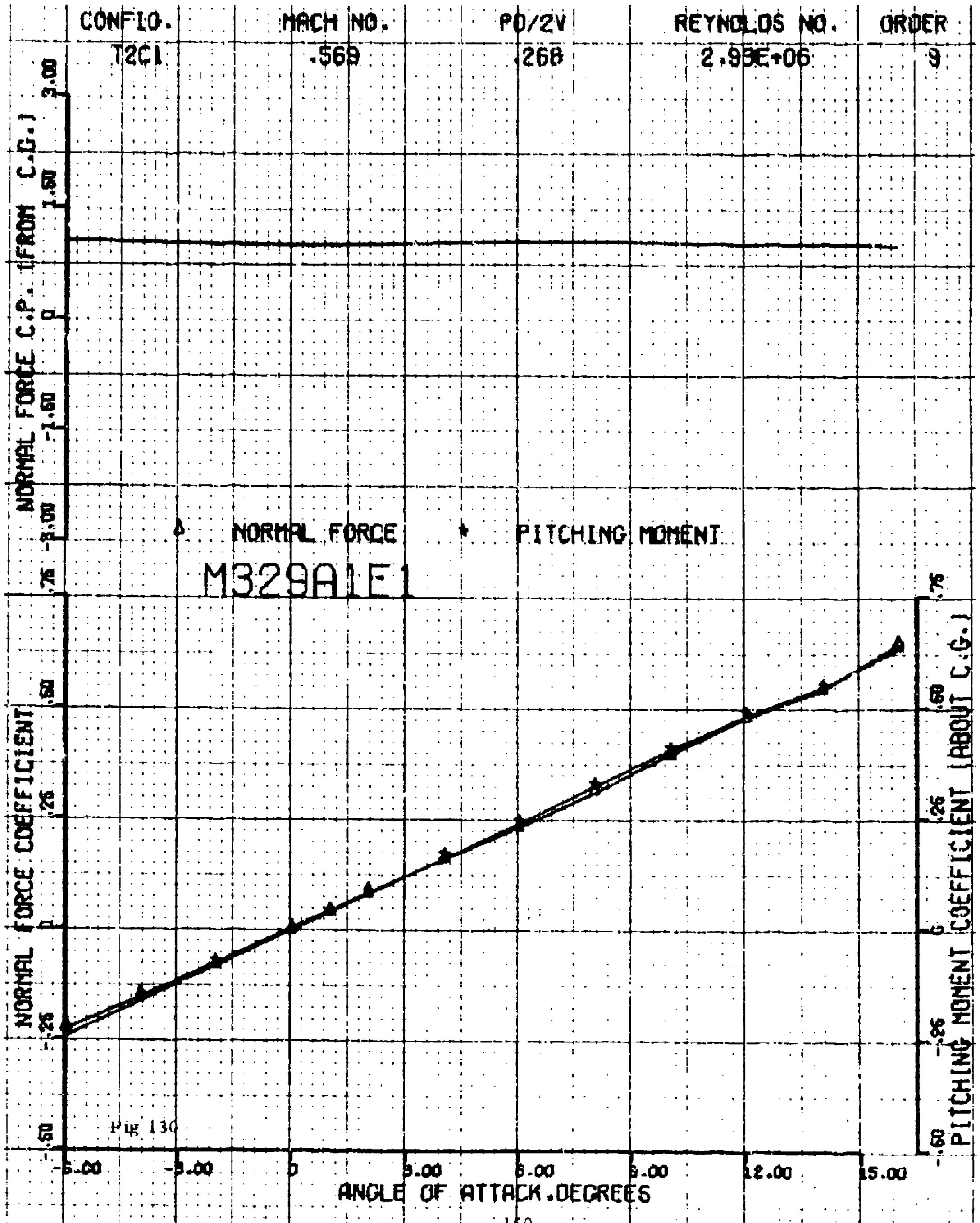

CONFIG. T2C1
MACH NO. .569
PD/2V .214
REYNOLDS NO. 2.99E+06
ORDER 9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00

Fig 129


CONFIG.
T2C1
MACH NO.
.569
PD/2V
.268
REYNOLDS NO.
2.93E+06
ORDER
9
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 130

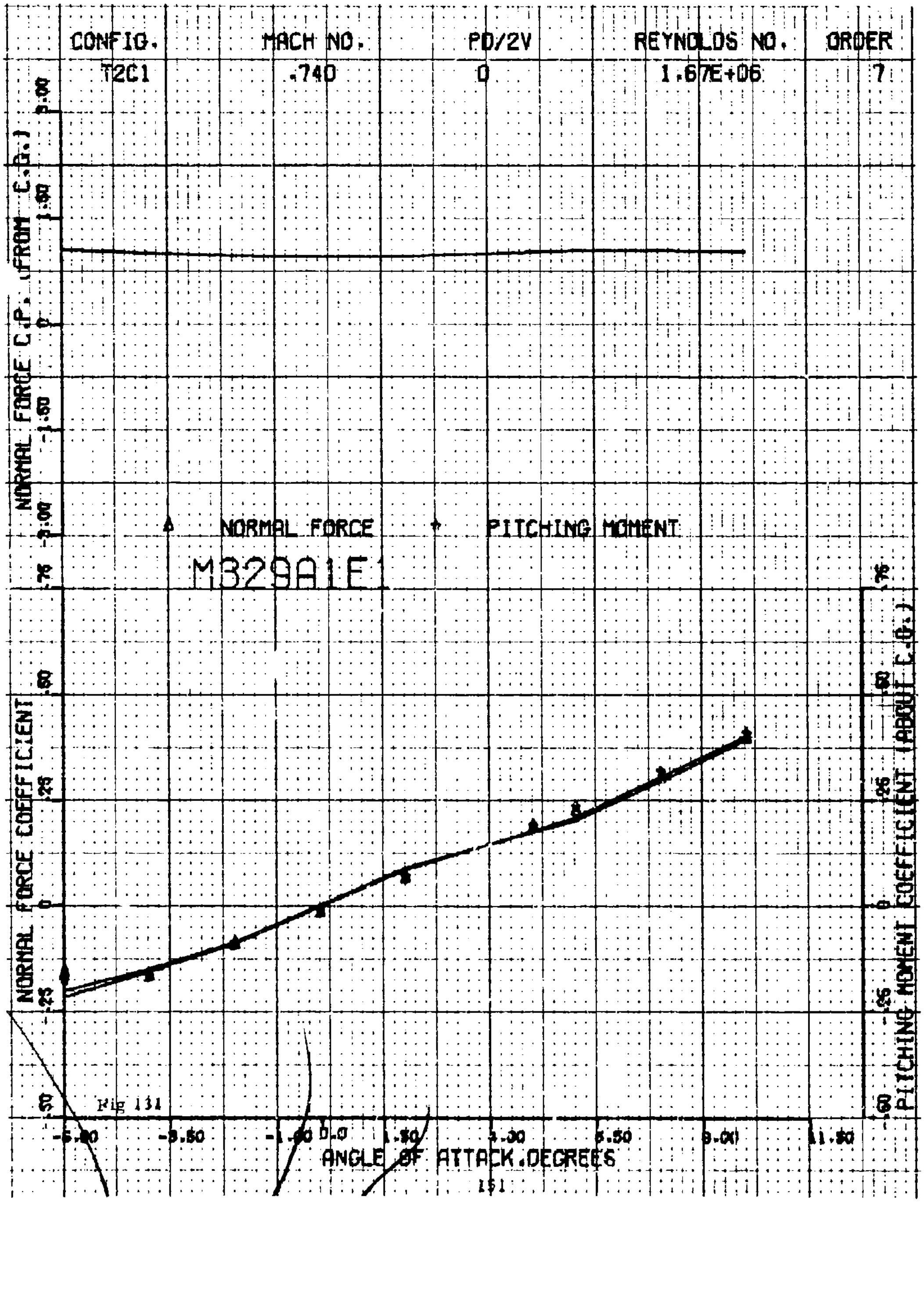
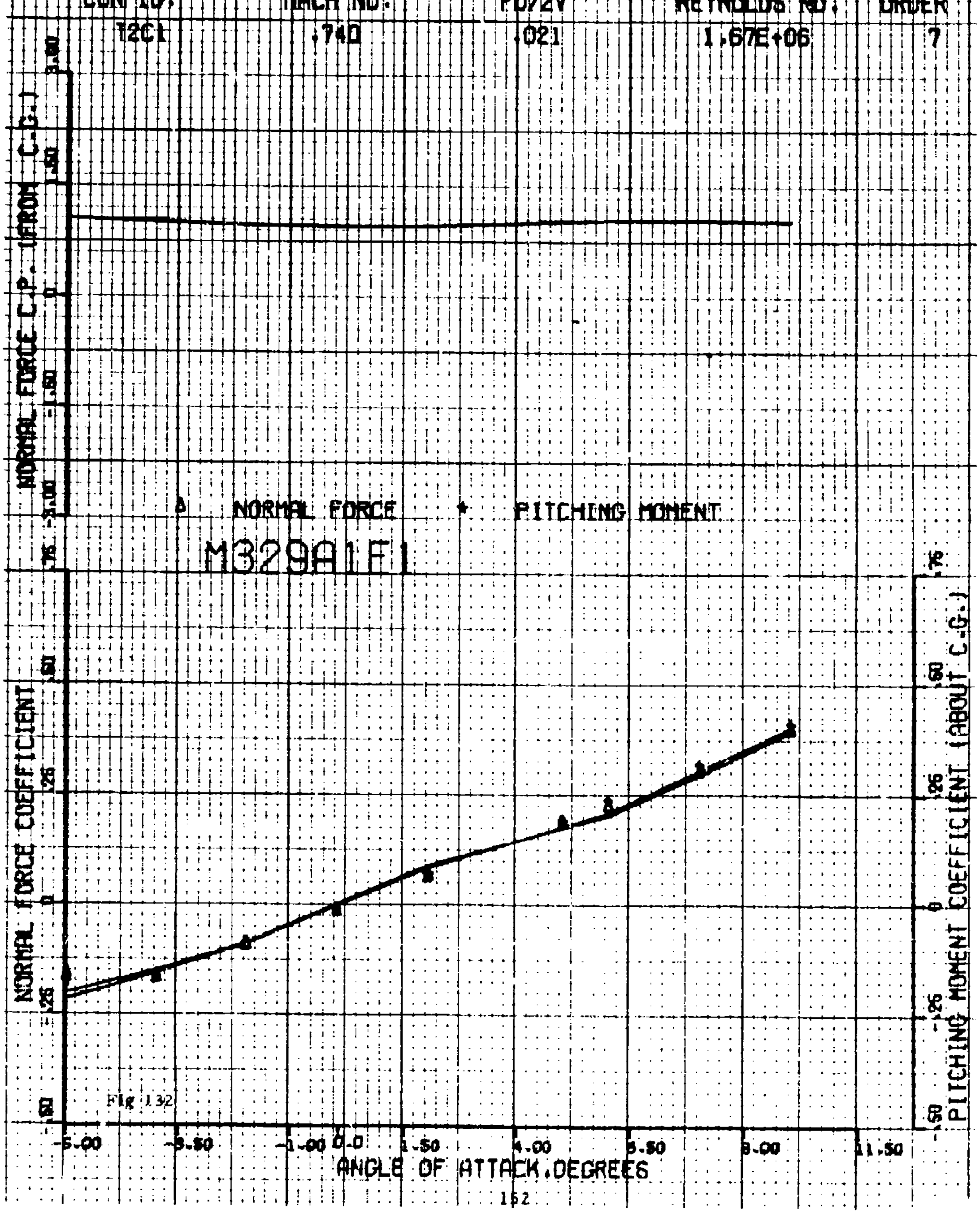
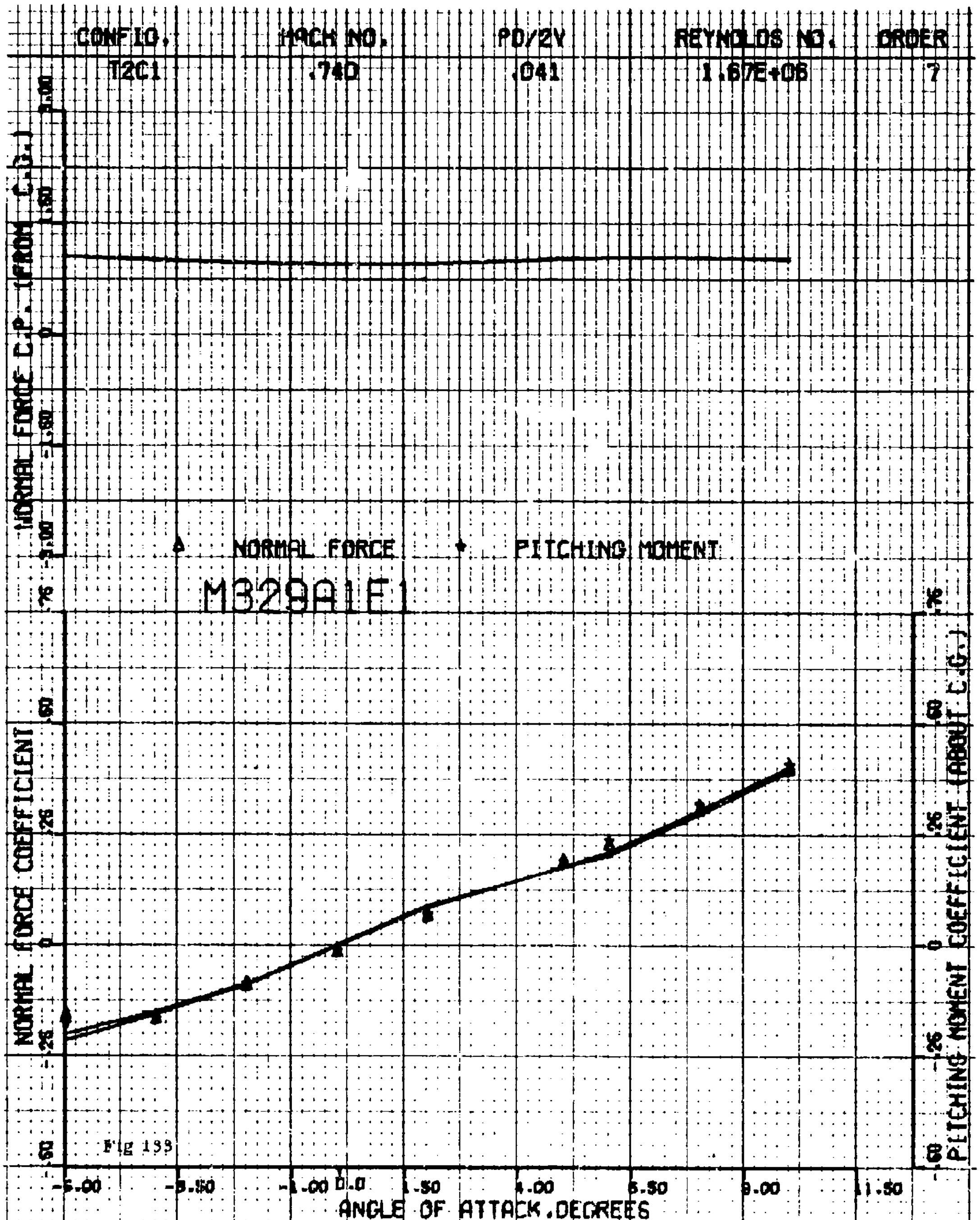

CONFIG.
T2C1
MACH NO.
.740
PD/2V
0
REYNOLDS NO.
1.67E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

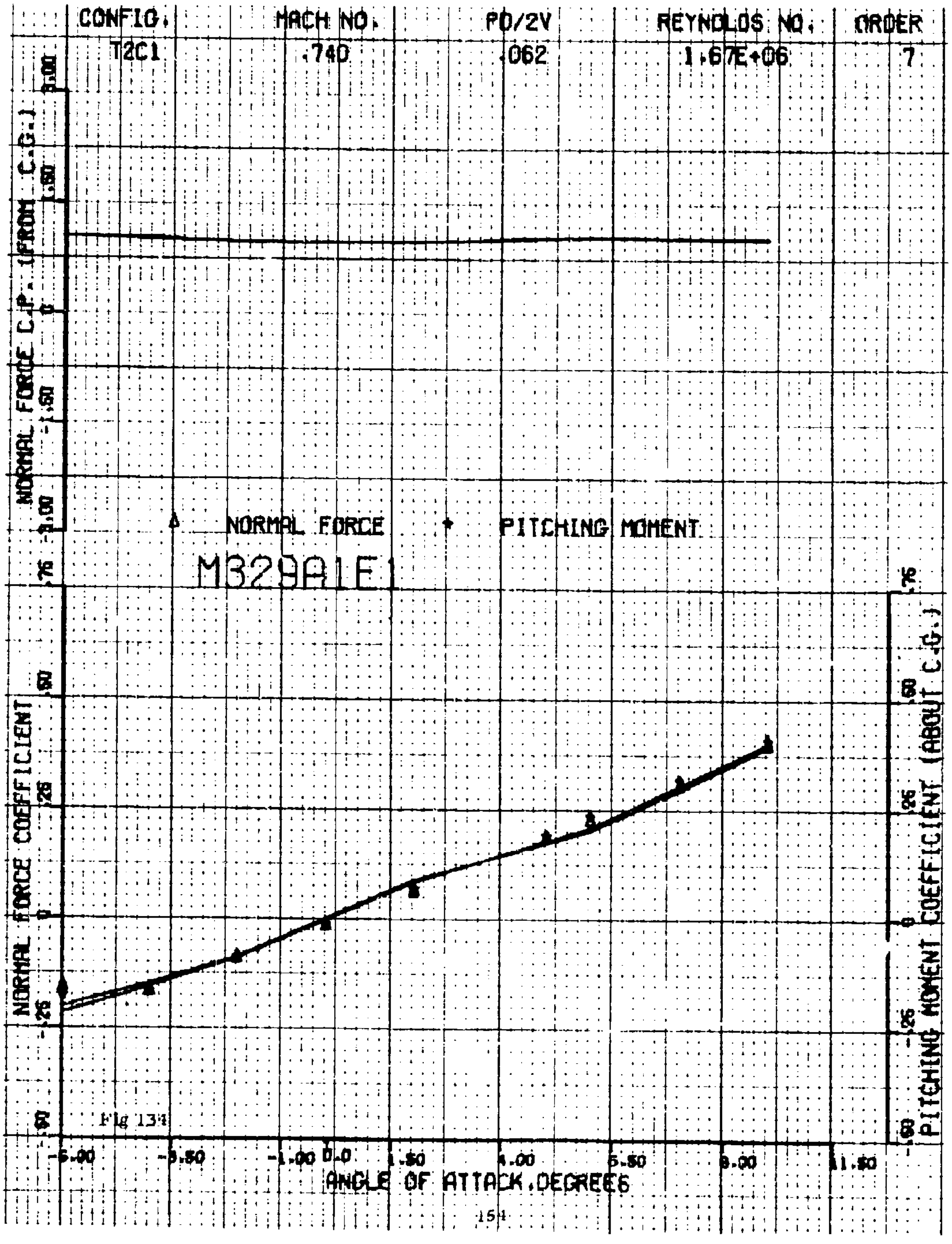
Fig 131

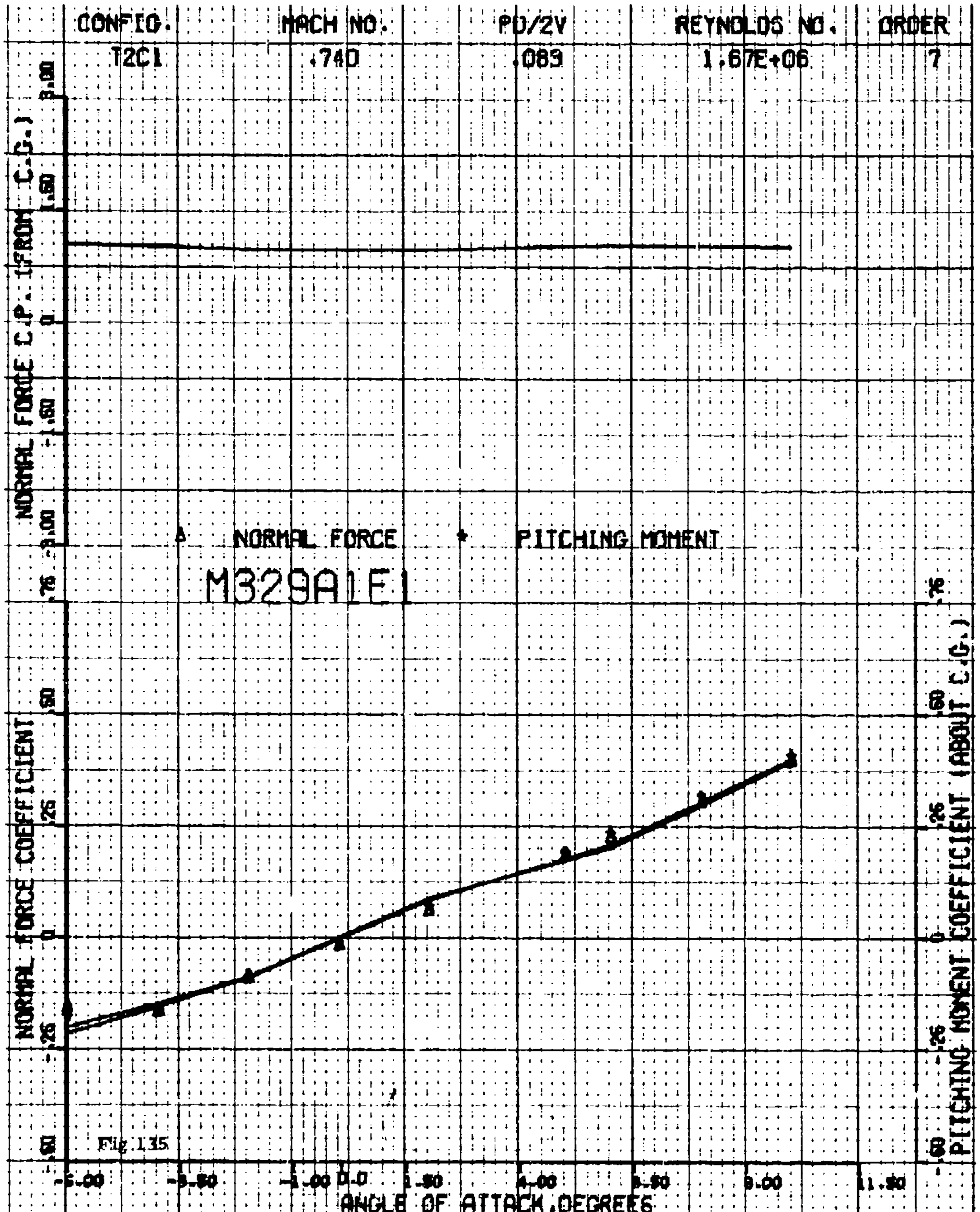


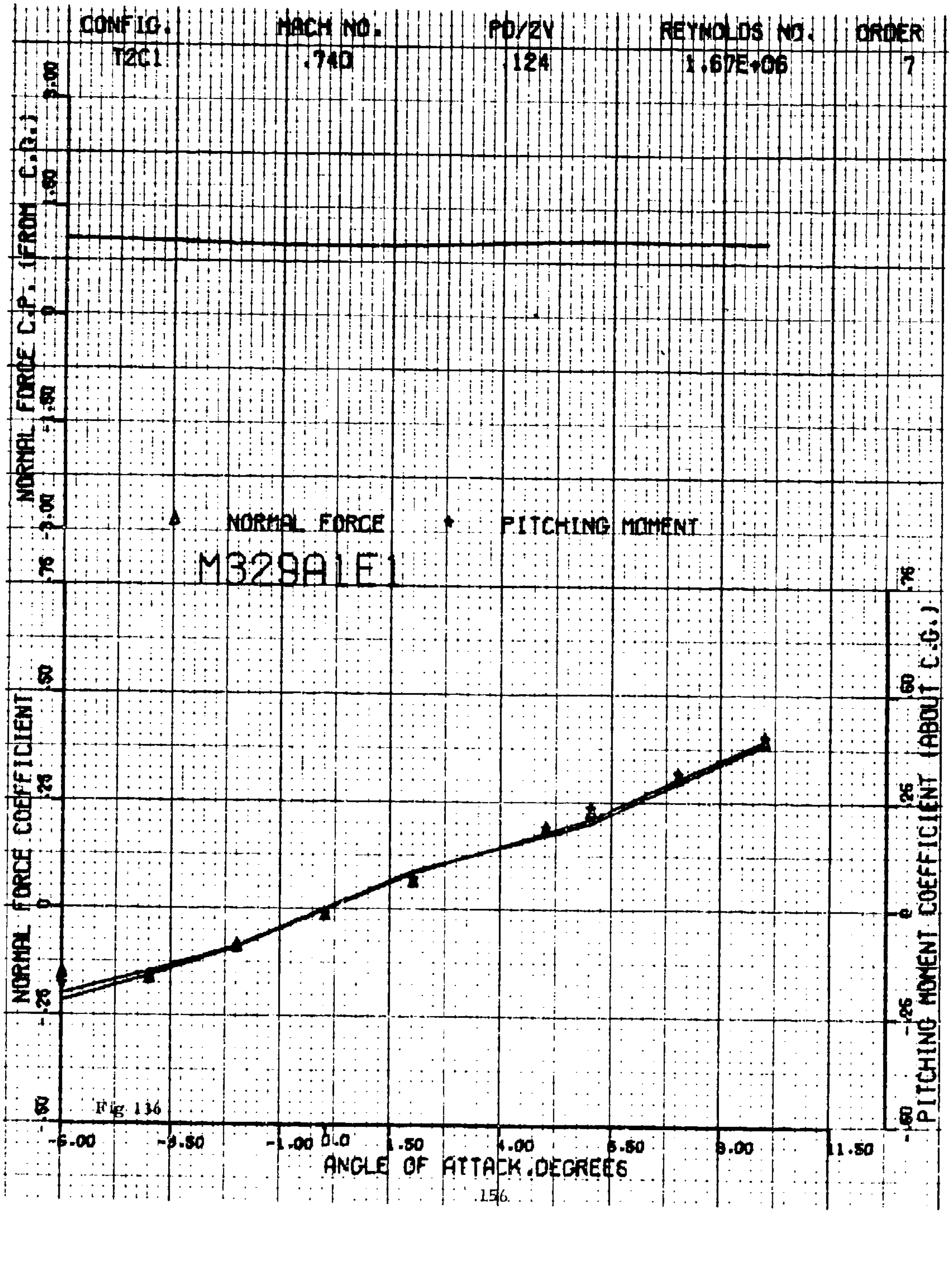
CONFIG.
T2C1
MACH NO.
.740
PD/2V
.021
REYNOLDS NO.
1.67E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 132


CONFIG. T2C1
MACH NO. .740
PD/2V .041
REYNOLDS NO. 1.67E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
Fig 133

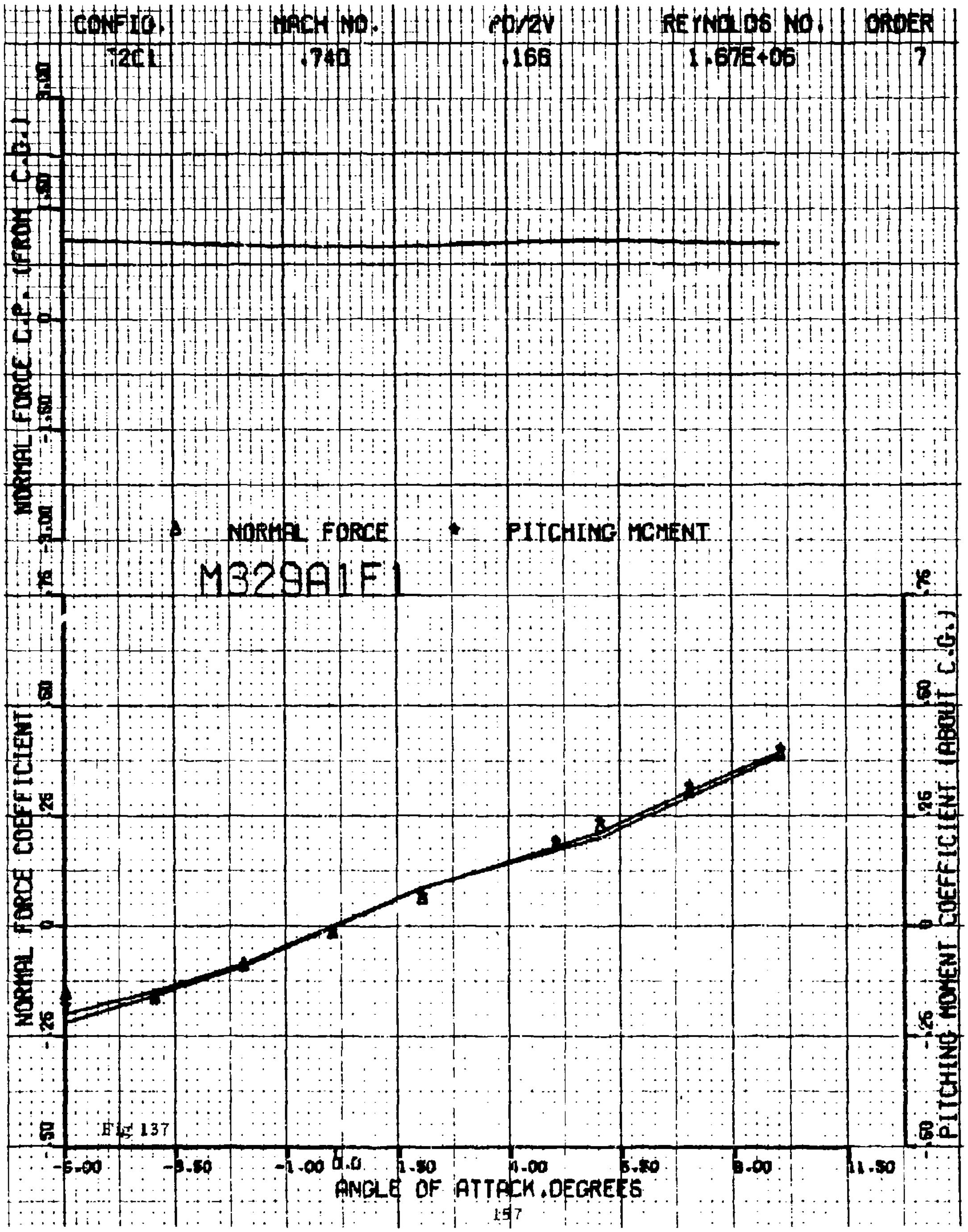

CONFIG. T2C1
MACH NO. .740
PD/2V .062
REYNOLDS NO. 1.67E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 134

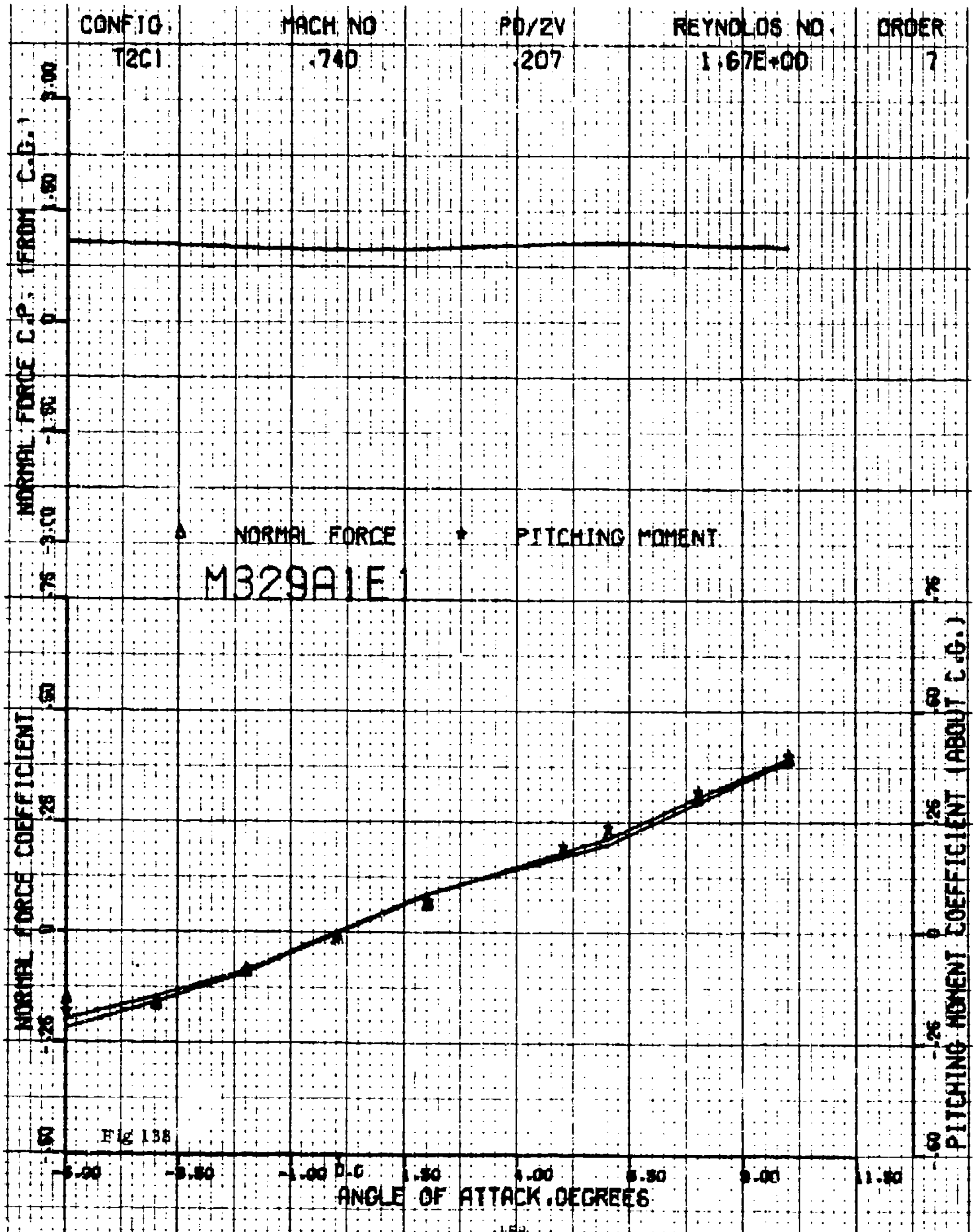

CONFIG. T2C1
MACH NO. .740
PD/2V .083
REYNOLDS NO. 1.67E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
ANGLE OF ATTACK, DEGREES
Fig. 135



CONFIG.
T2C1
MACH NO.
.740
PD/2V
.124
REYNOLDS NO.
1.67E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig. 136


CONFIG.
T2C1
MACH NO.
.740
ΦD/2V
.166
REYNOLDS NO.
1.67E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 137



CONFIG
T2C1
MACH NO
.740
PD/2V
.207
REYNOLDS NO
1.67E+00
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 138

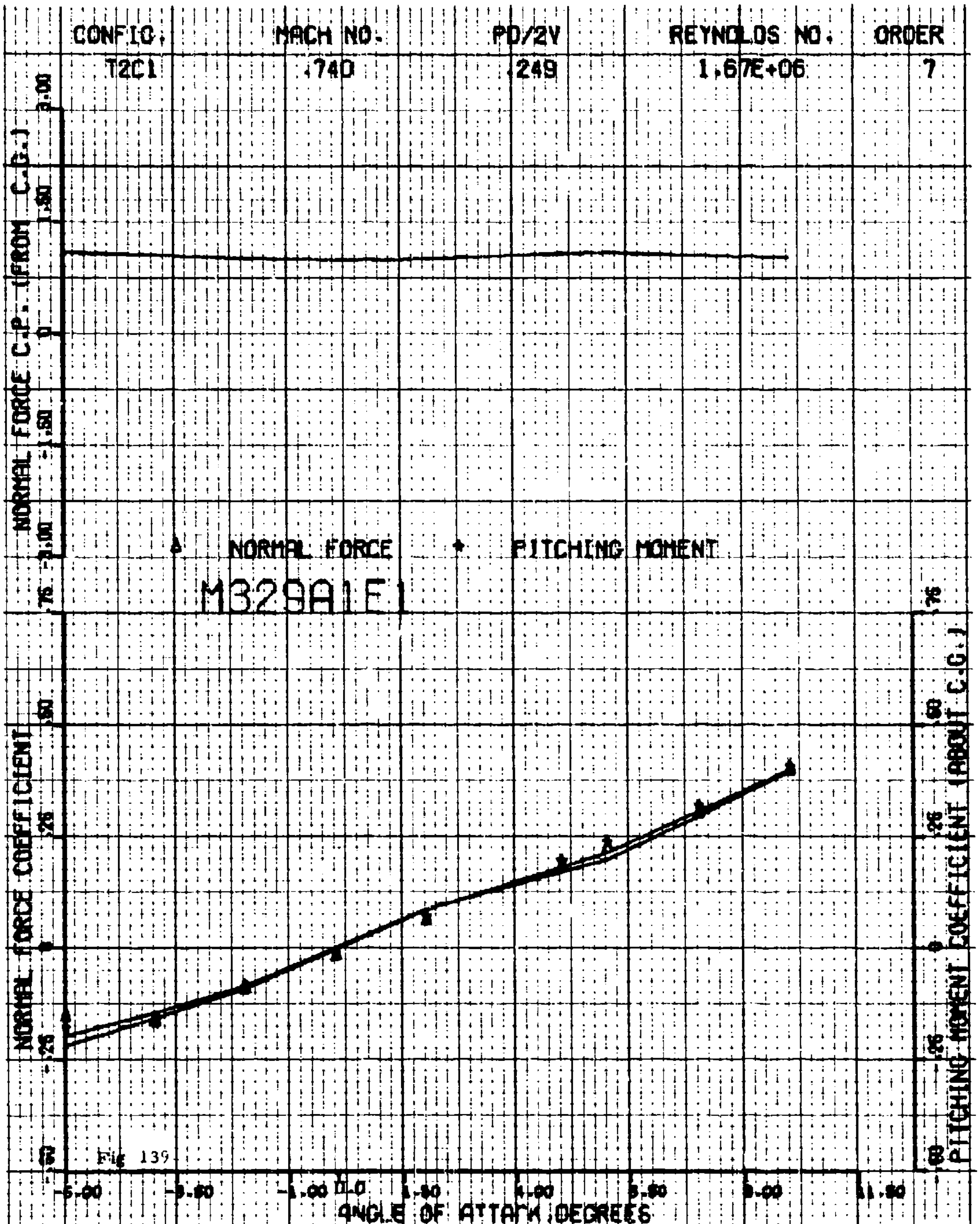

CONFIG. T2C1
MACH NO. .740
PD/2V .249
REYNOLDS NO. 1.67E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK DEGREES

Fig 139

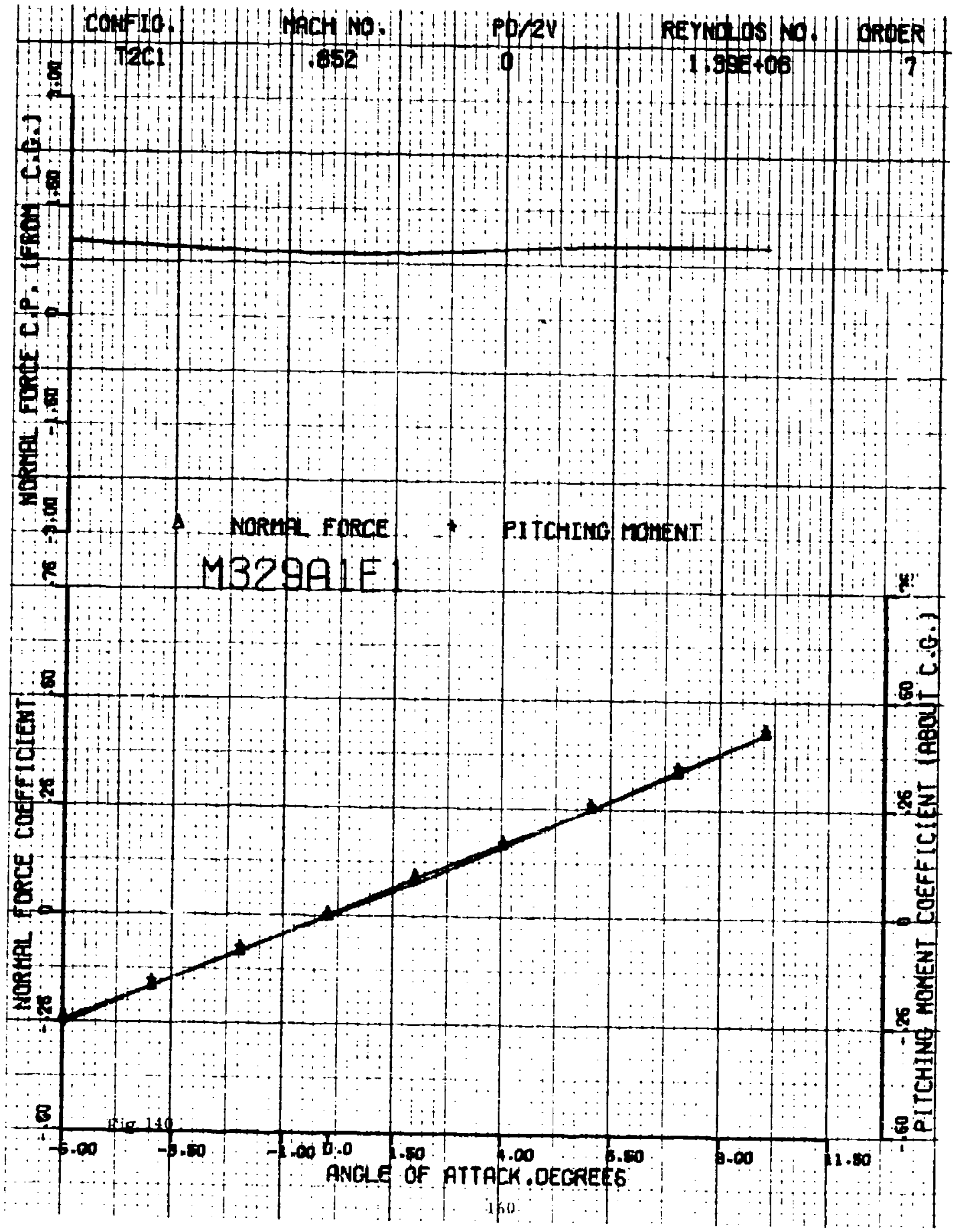
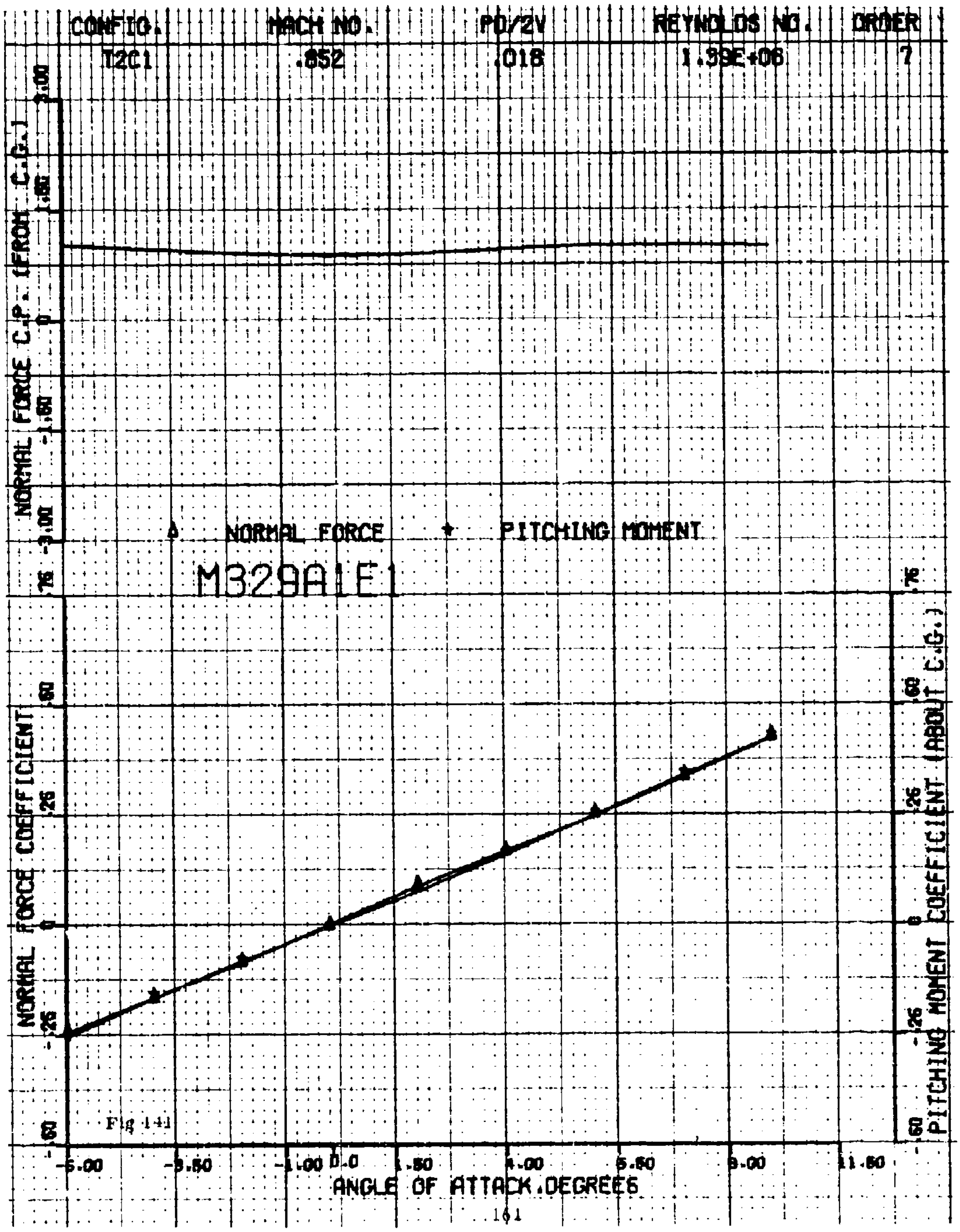
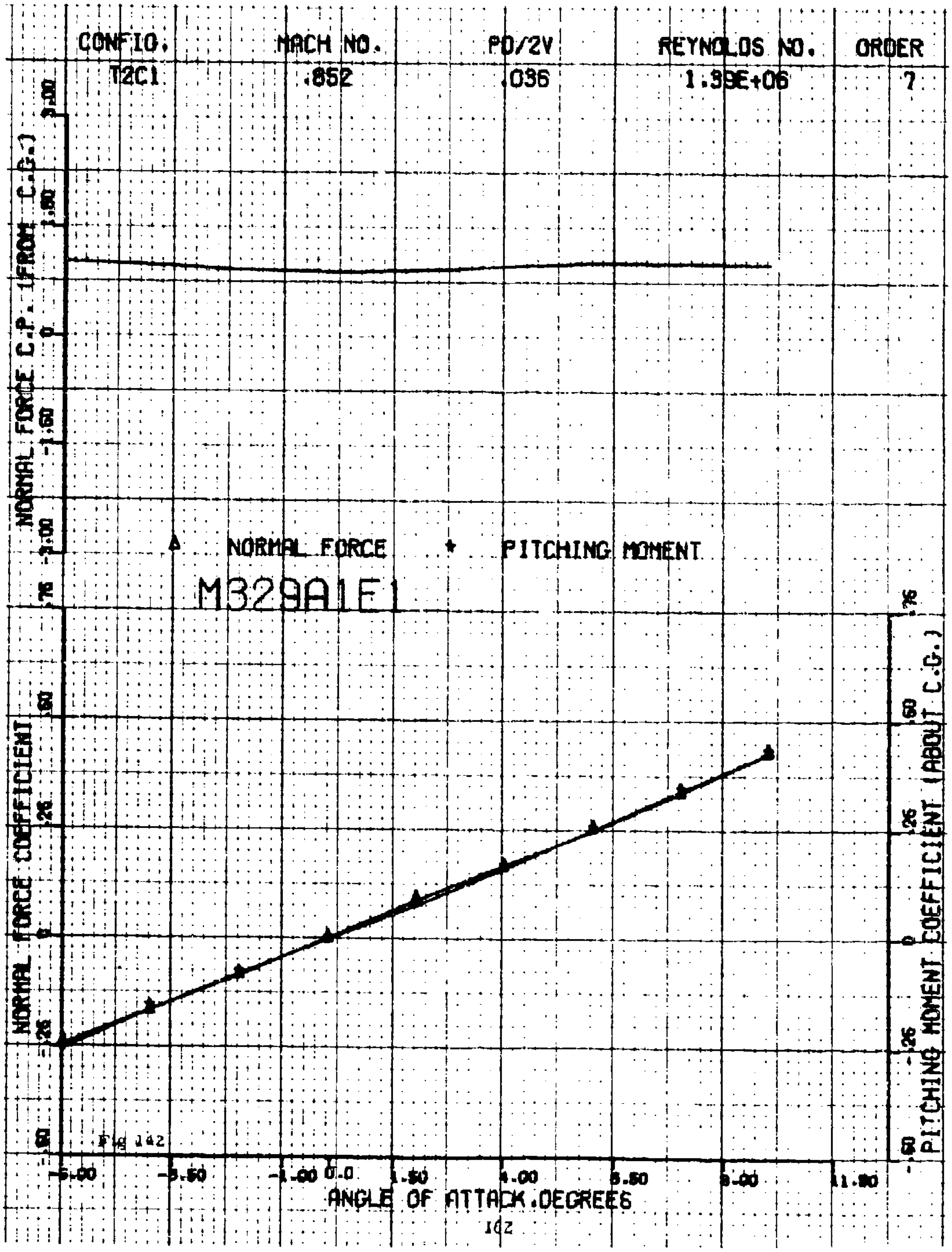

CONFIG.
T2C1
MACH NO.
.852
PD/2V
0
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1F1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

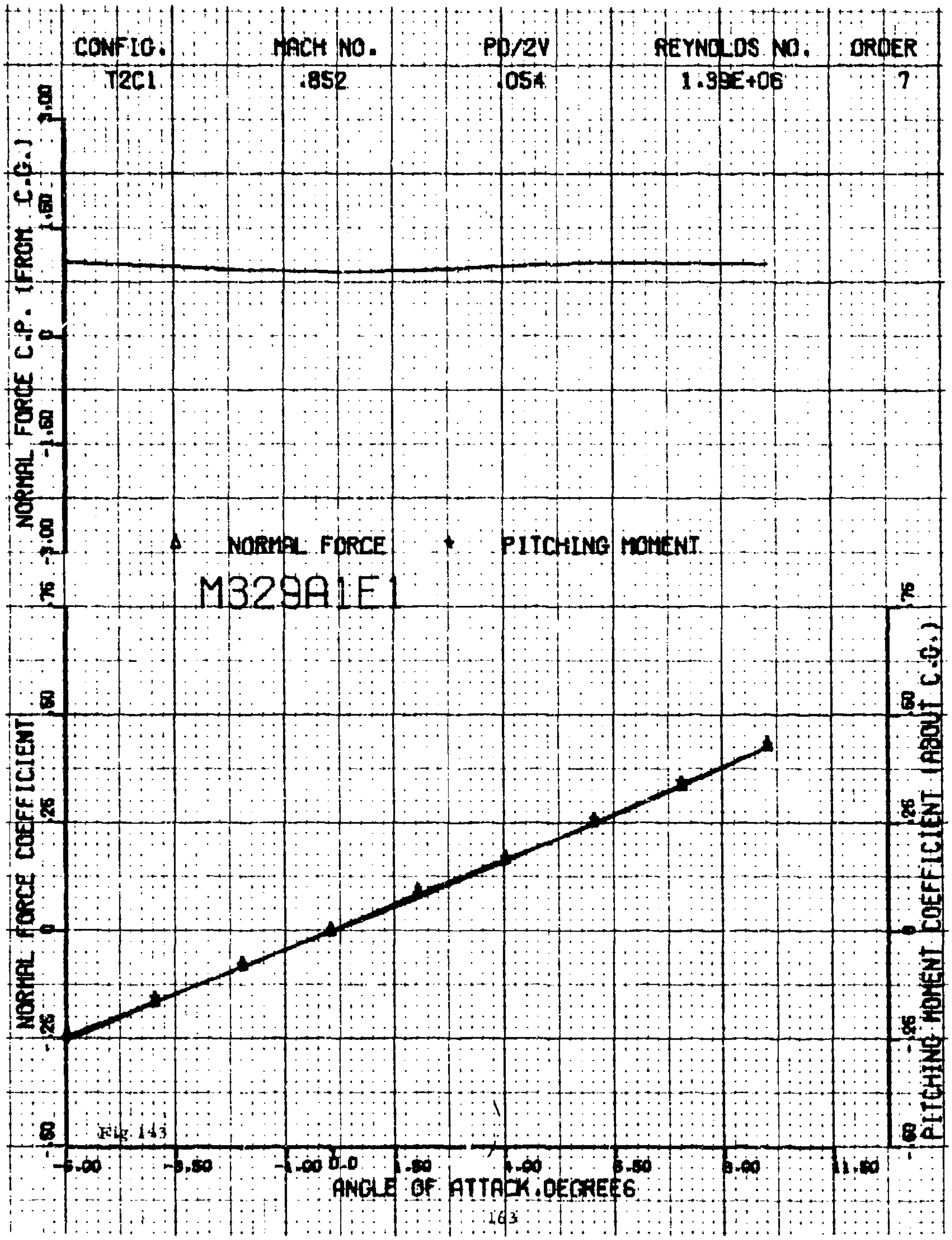
Fig. 140

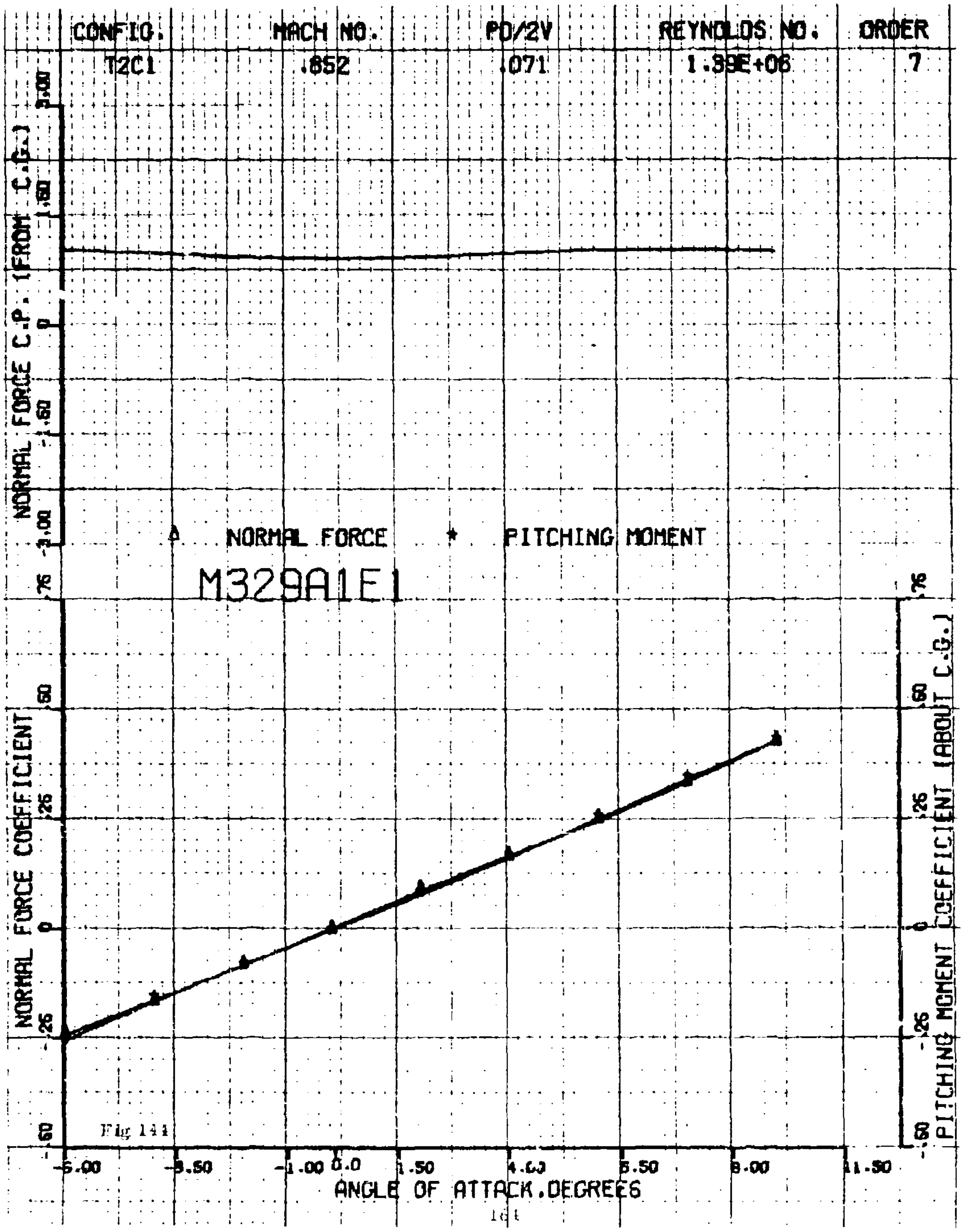


CONFIG.
T2C1
MACH NO.
.852
PD/2V
.018
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 141

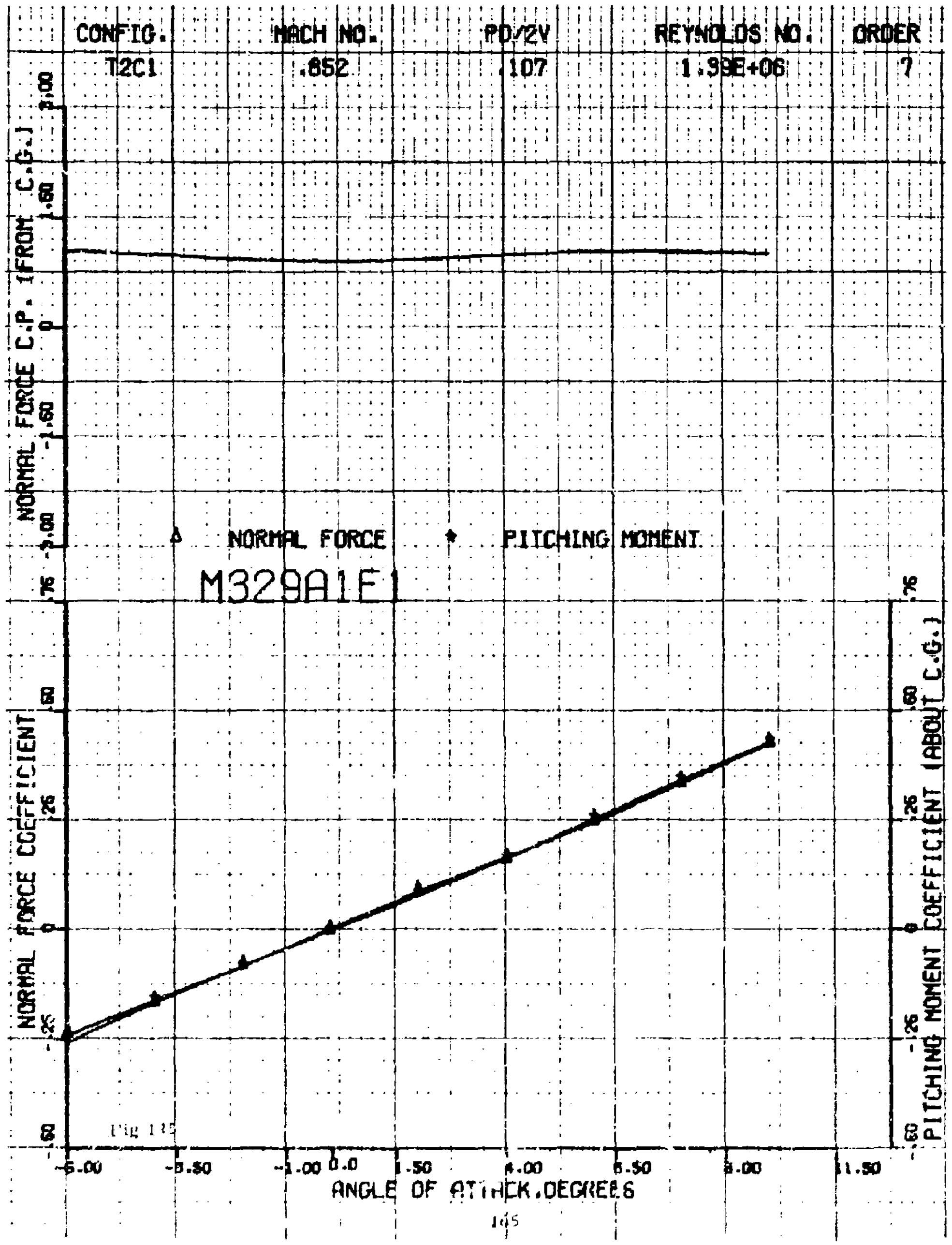

CONFIG.
T2C1
MACH NO.
.852
PD/2V
.036
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
Fig 142
ANGLE OF ATTACK,DEGREES
102

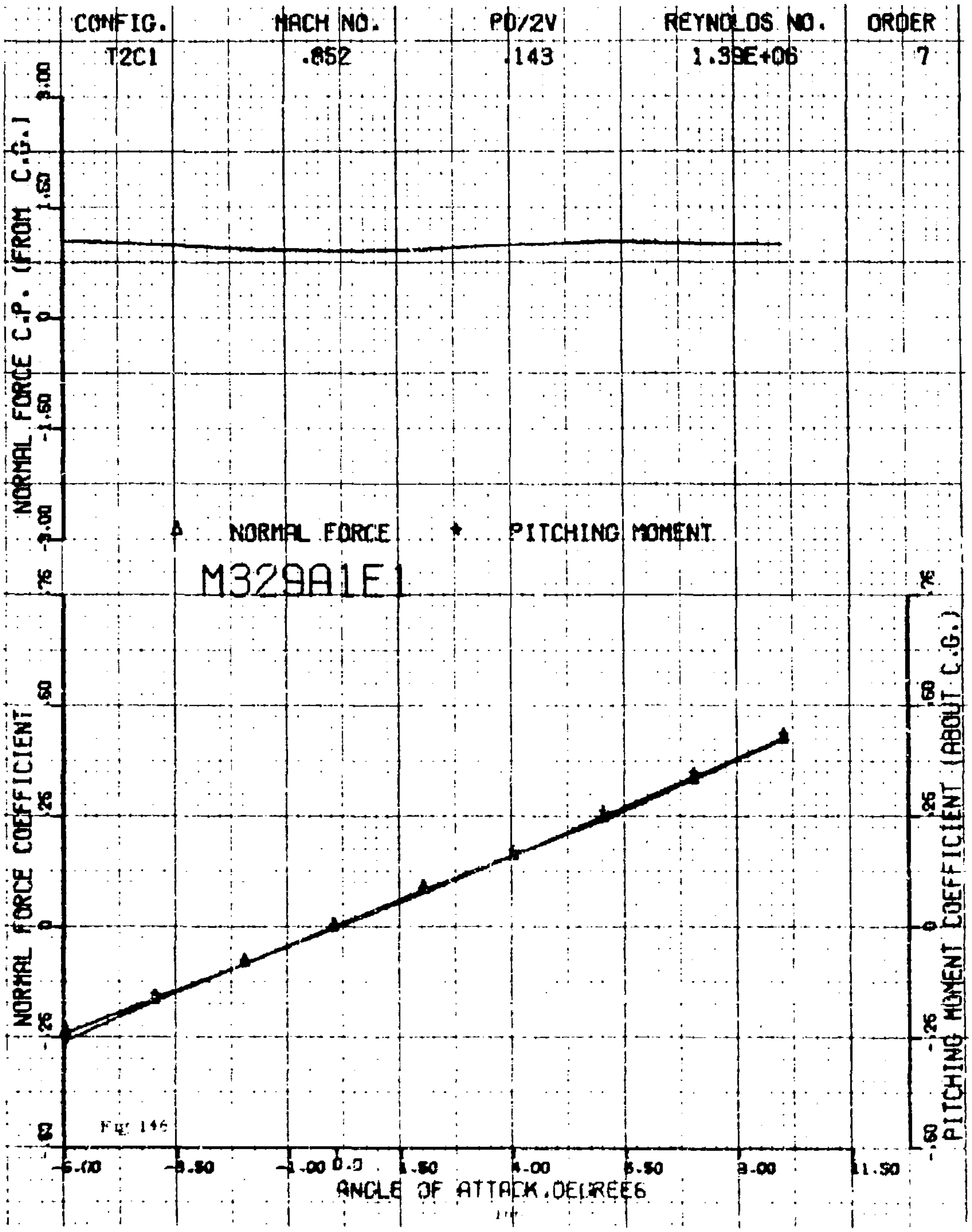

CONFIG.
T2C1
MACH NO.
.852
PD/2V
.054
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig. 143



CONFIG.
T2C1
MACH NO.
.852
PD/2V
.071
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

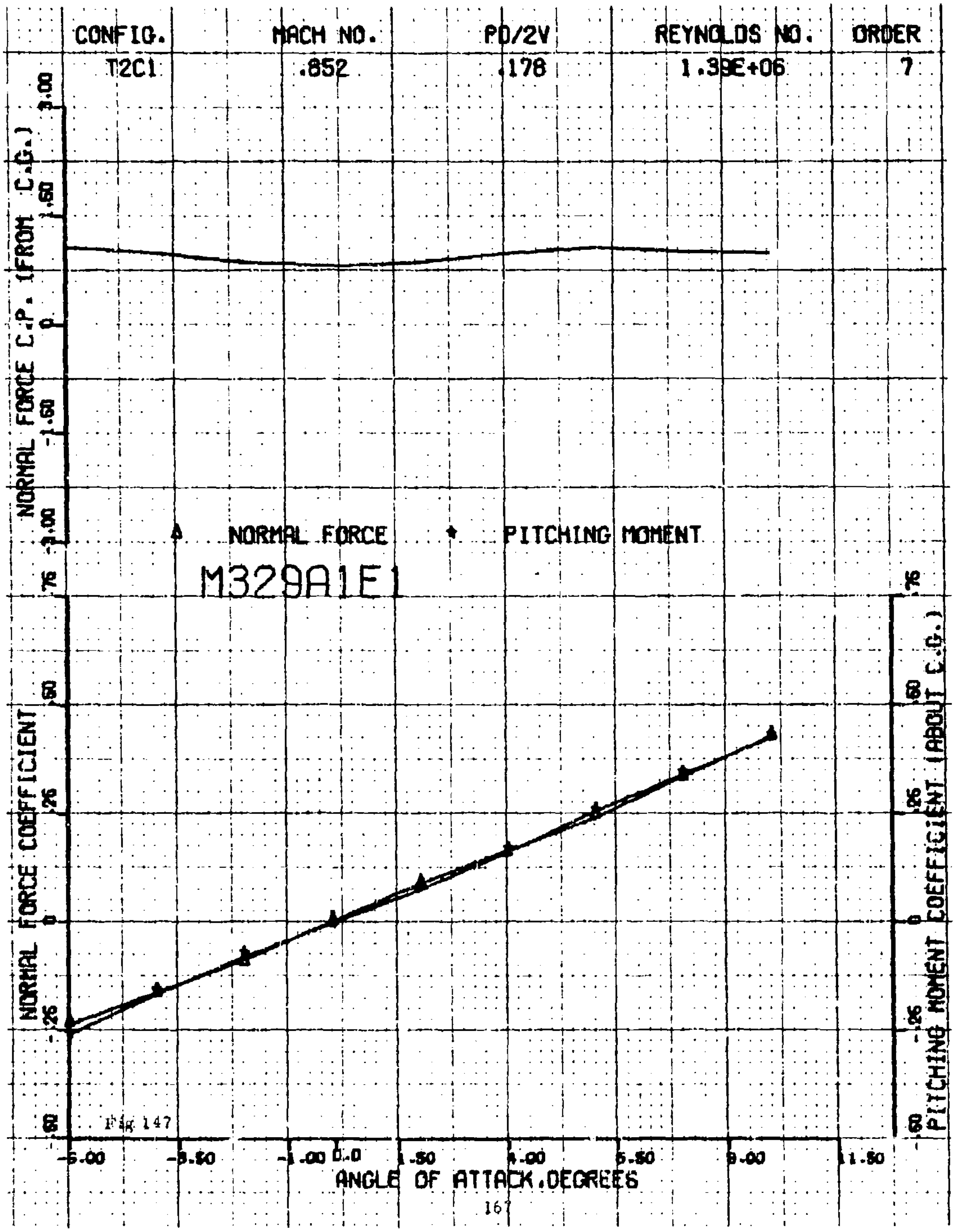
Fig 144


CONFIG. T2C1
MACH NO. .852
PD/2V .107
REYNOLDS NO. 1.39E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES



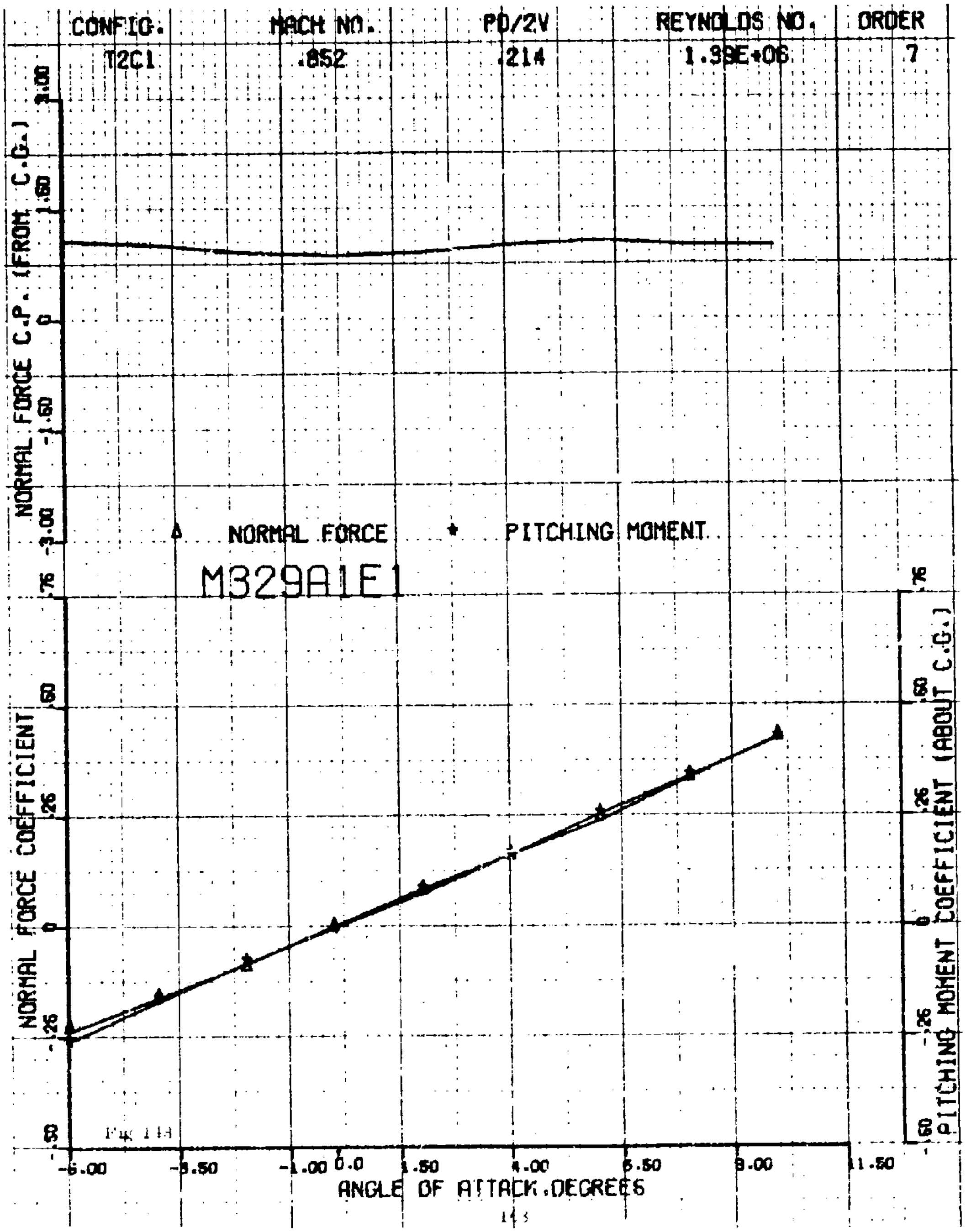
CONFIG.
T2C1
MACH NO.
.852
PD/2V
.143
REYNOLDS NO.
1.39E+06
ORDER
7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig. 146

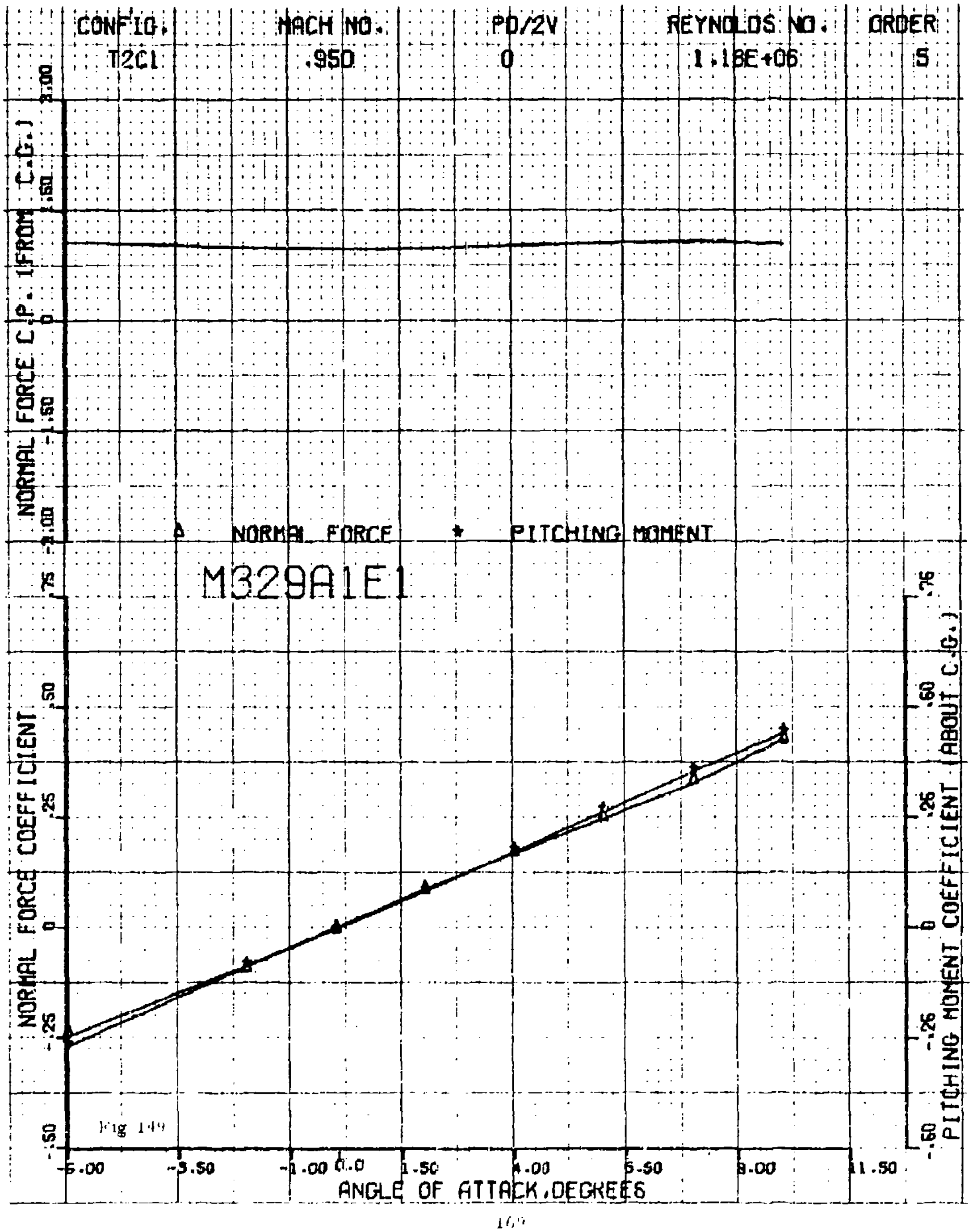


CONFIG. T2C1
MACH NO. .852
PD/2V .178
REYNOLDS NO. 1.39E+06
ORDER 7
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 147

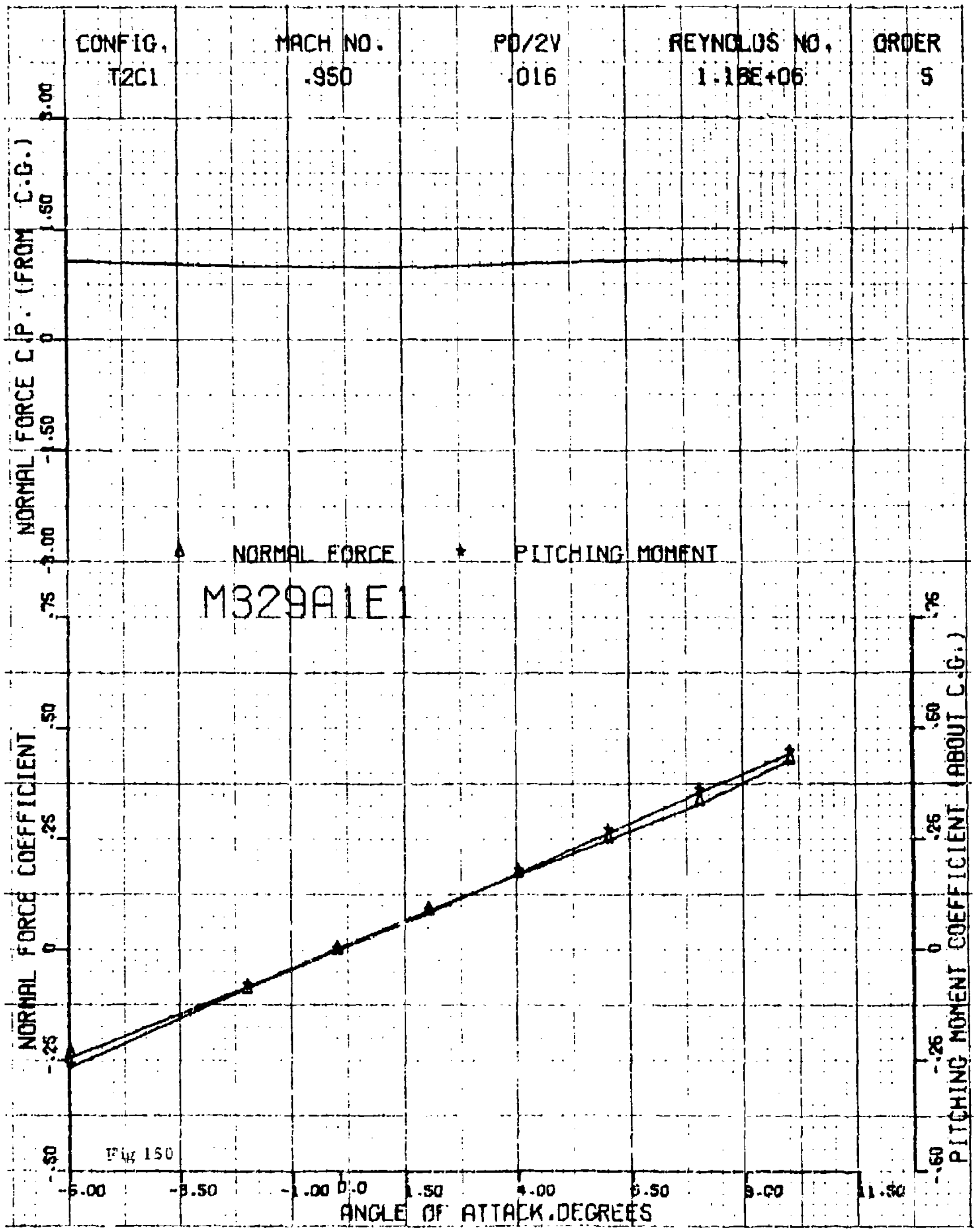


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.852
.214
1.39E+06
7
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.76
.50
.26
0
-.26
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK,DEGREES



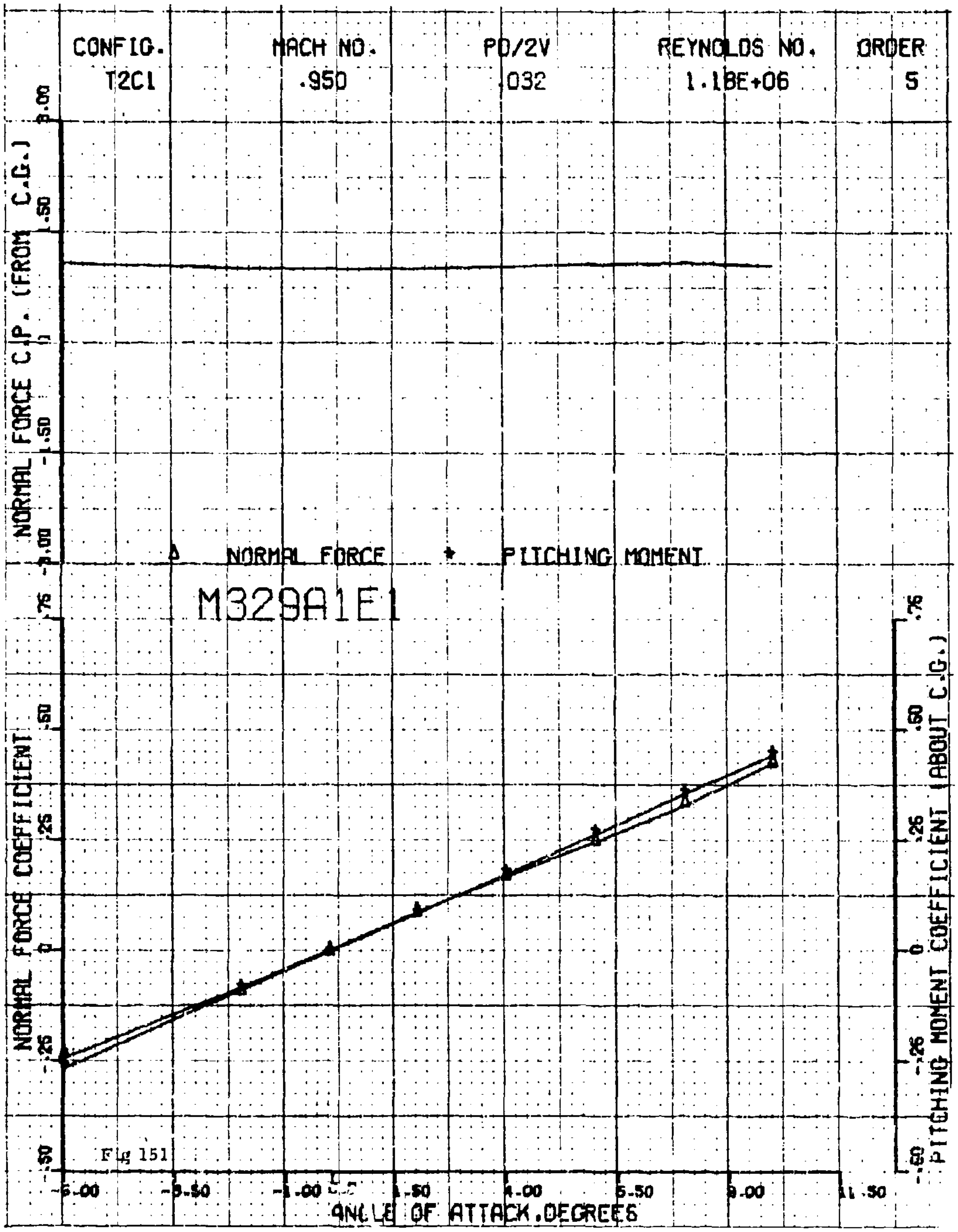
CONFIG. T2C1
MACH NO. .950
PD/2V 0
REYNOLDS NO. 1.18E+06
ORDER 5
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
.76
.50
.26
0
-.26
-.50
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK, DEGREES

Fig 149



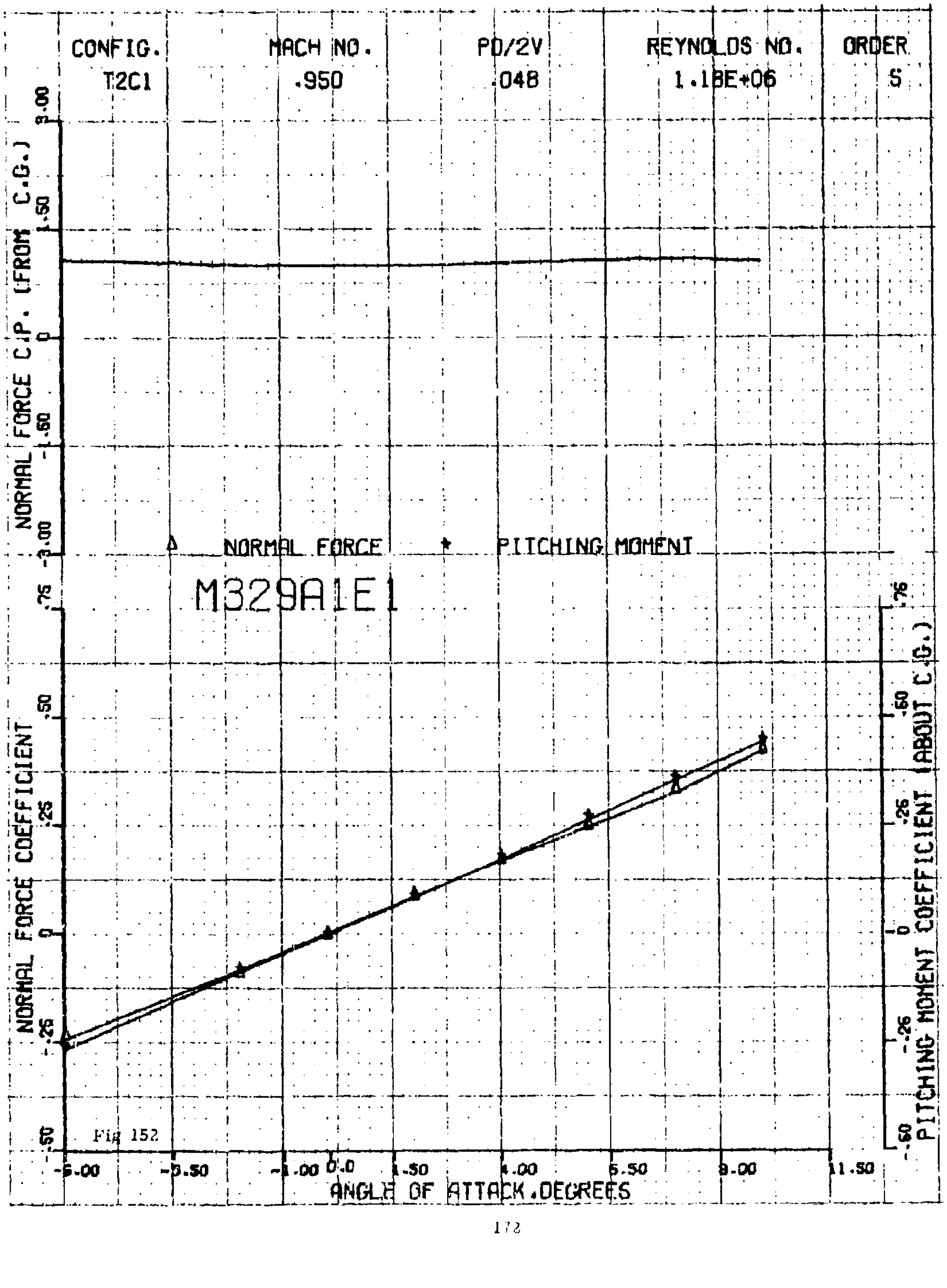
CONFIG.
T2C1
MACH NO.
.950
PD/2V
.016
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 150



CONFIG.
T2C1
MACH NO.
.950
PD/2V
.032
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 151


CONFIG.
T2C1
MACH NO.
.950
PD/2V
.048
REYNOLDS NO.
1.18E+06
ORDER
S
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 152

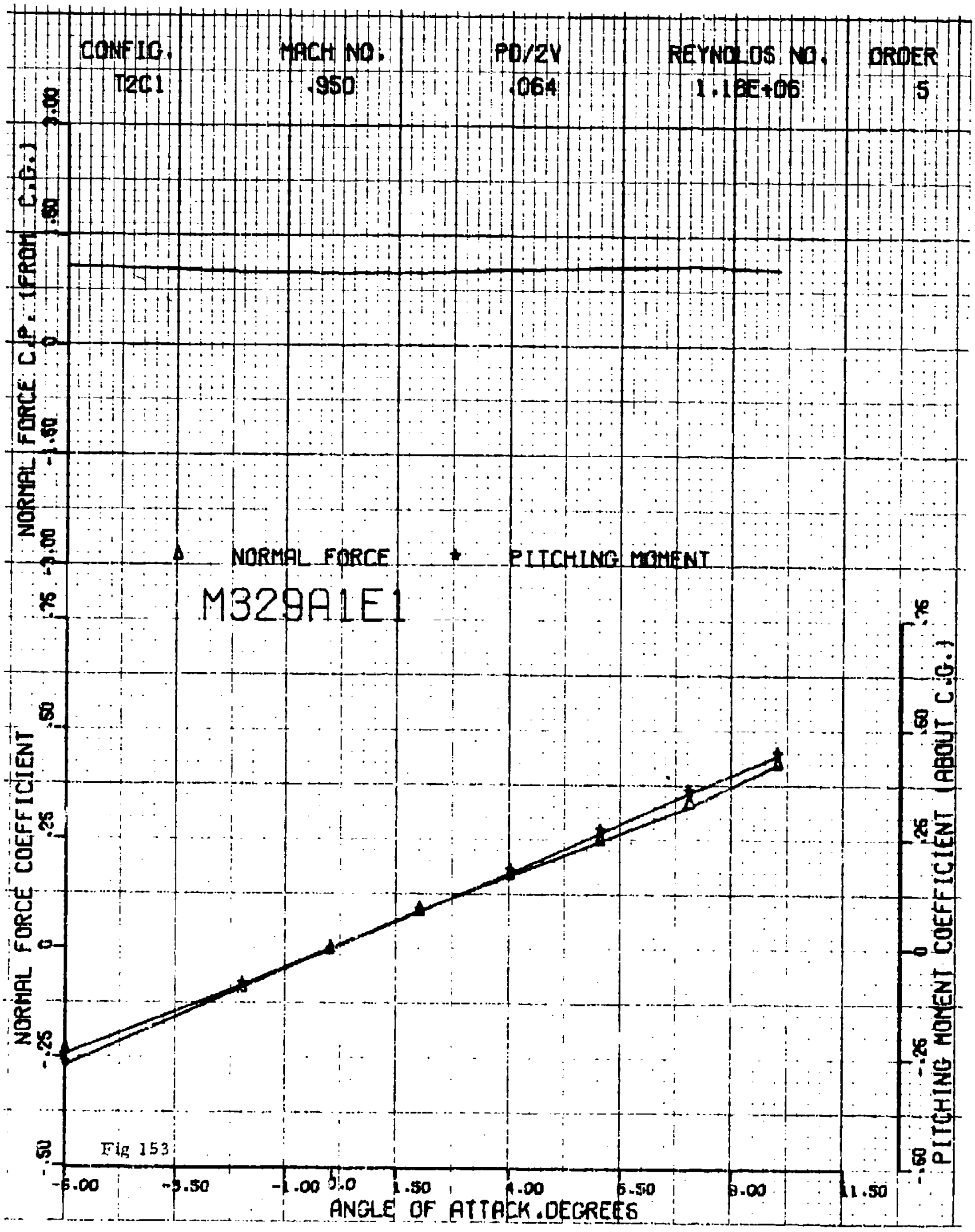
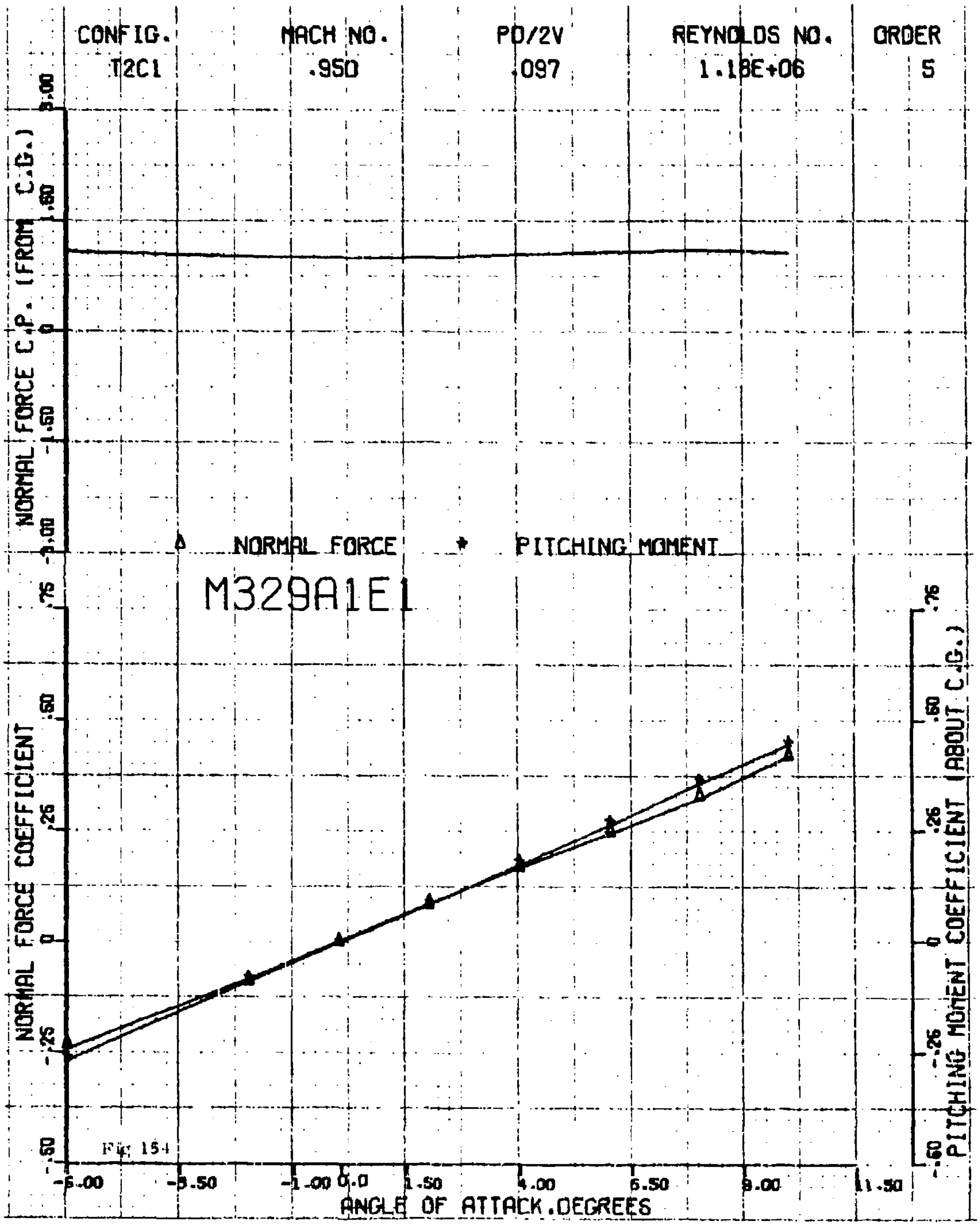
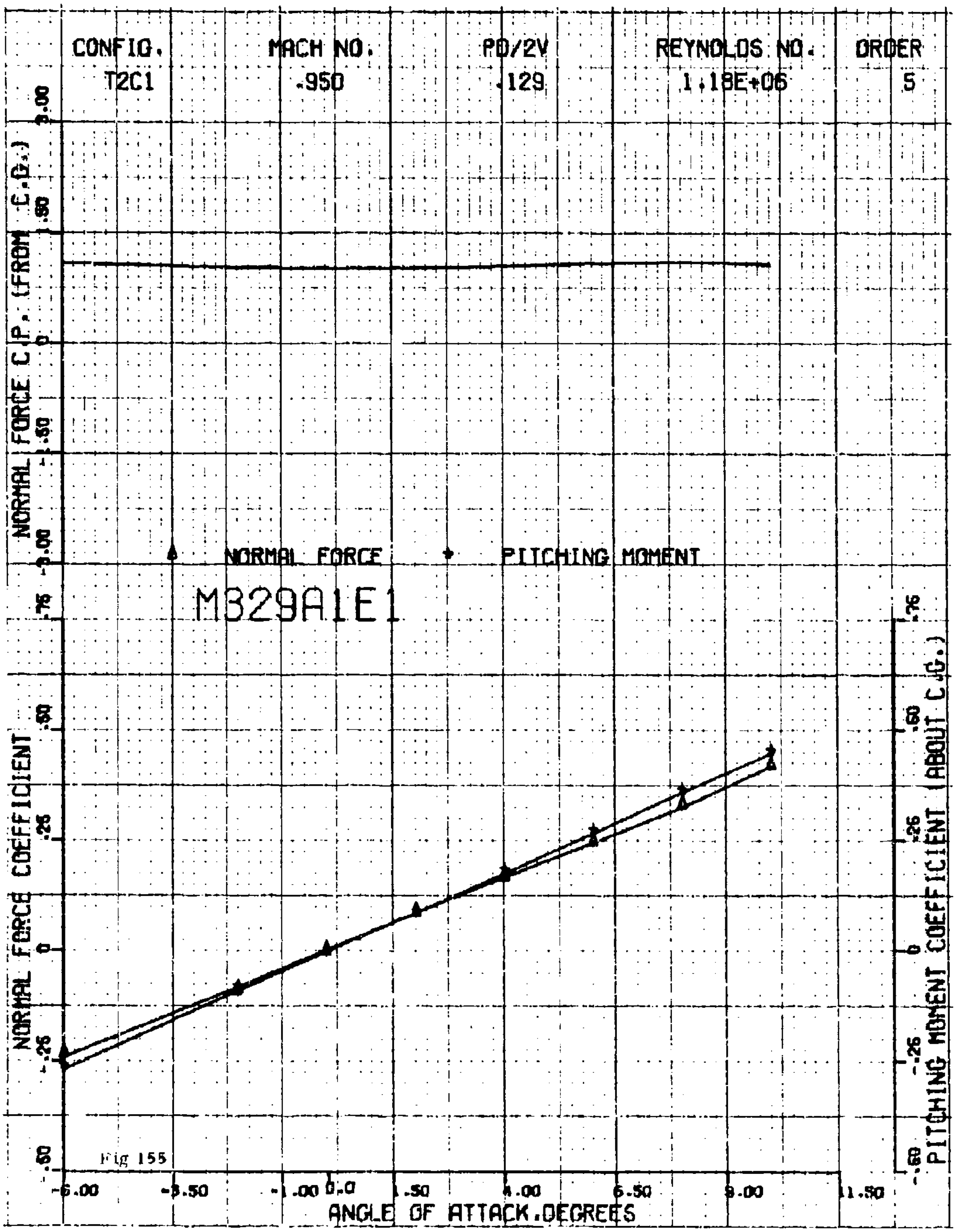

CONFIG.
T2C1
MACH NO.
.950
PD/2V
.064
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 153



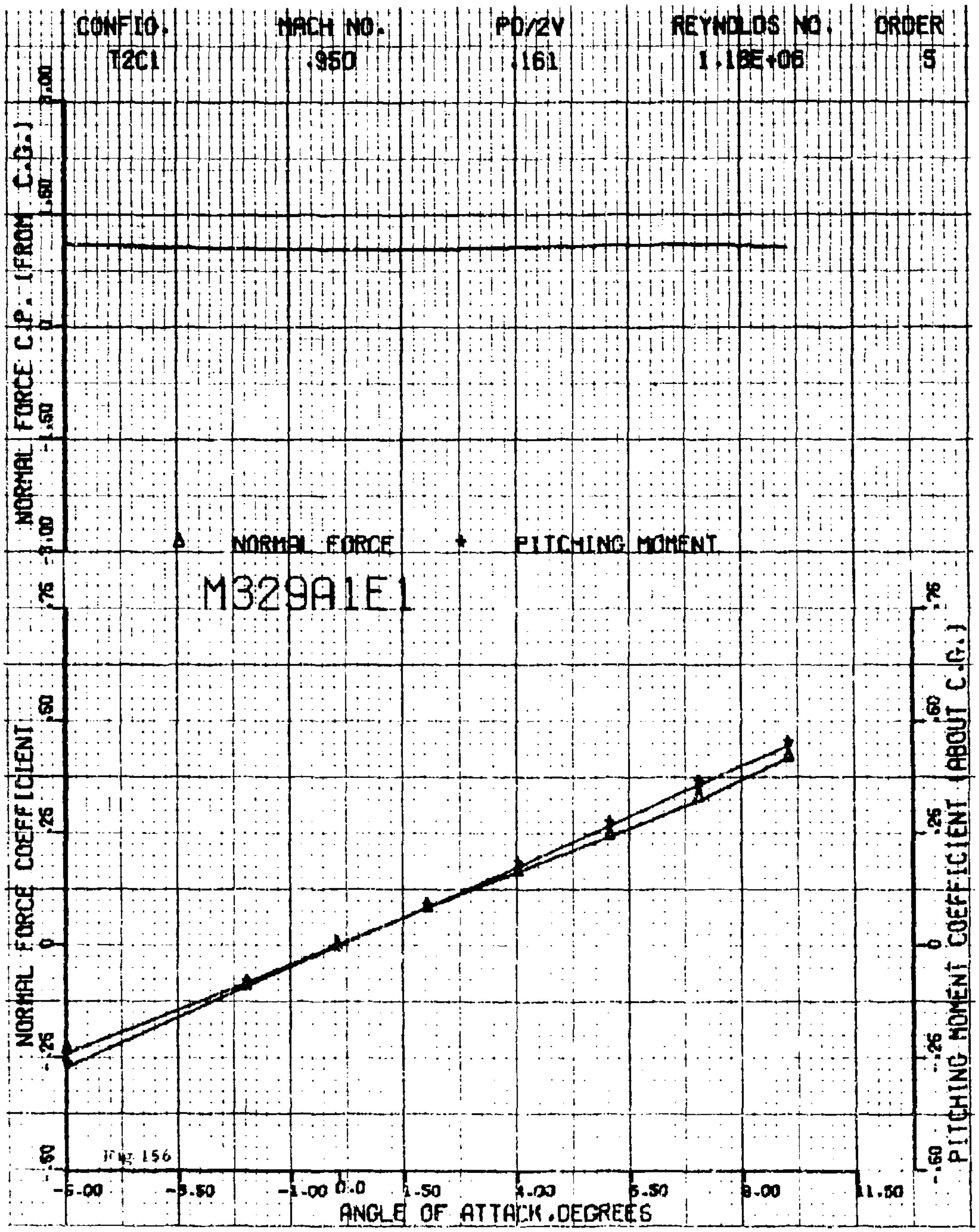
CONFIG.
T2C1
MACH NO.
.950
PD/2V
.097
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 154



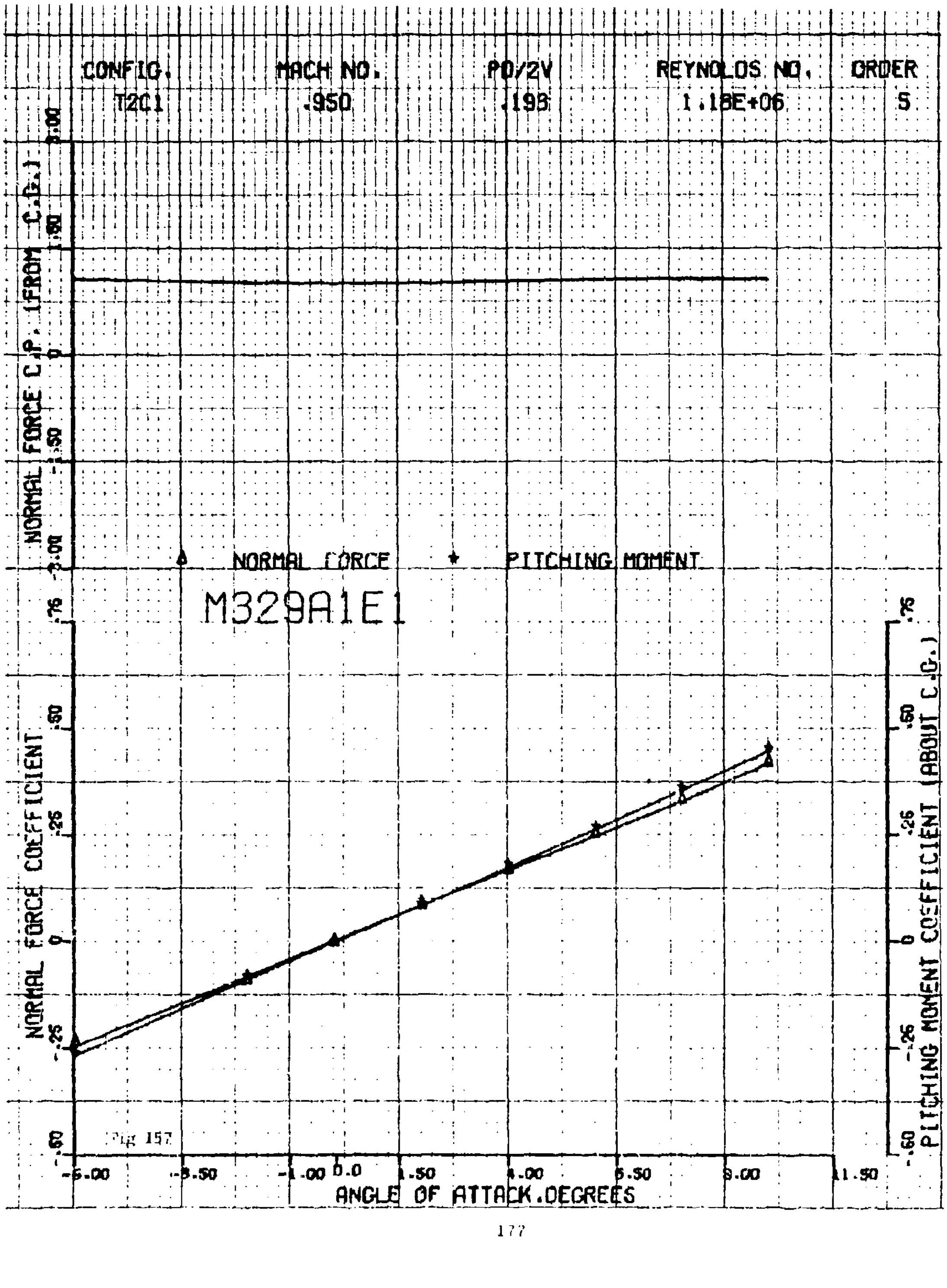
CONFIG.
T2C1
MACH NO.
.950
PD/2V
.129
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50

Fig 155



CONFIG.
T2C1
MACH NO.
.950
PD/2V
.161
REYNOLDS NO.
1.18E+06
ORDER
5
NORMAL FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
.75
.50
.25
0
-.25
-.50
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
-5.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK, DEGREES

Fig. 156



CONFIG. T2C1
MACH NO. .950
PD/2V .193
REYNOLDS NO. 1.18E+06
ORDER 5
NORMAL FORCE C.P. (FROM C.G.)
NORMAL FORCE
PITCHING MOMENT
M329A1E1
NORMAL FORCE COEFFICIENT
PITCHING MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 157

Figures 158 through 333

Magnus force coefficient, Magnus moment coefficient, Magnus force center of pressure vs angle of attack. (Includes several configurations, Mach numbers, pd/2V's and Reynolds numbers [12' PWT] .)

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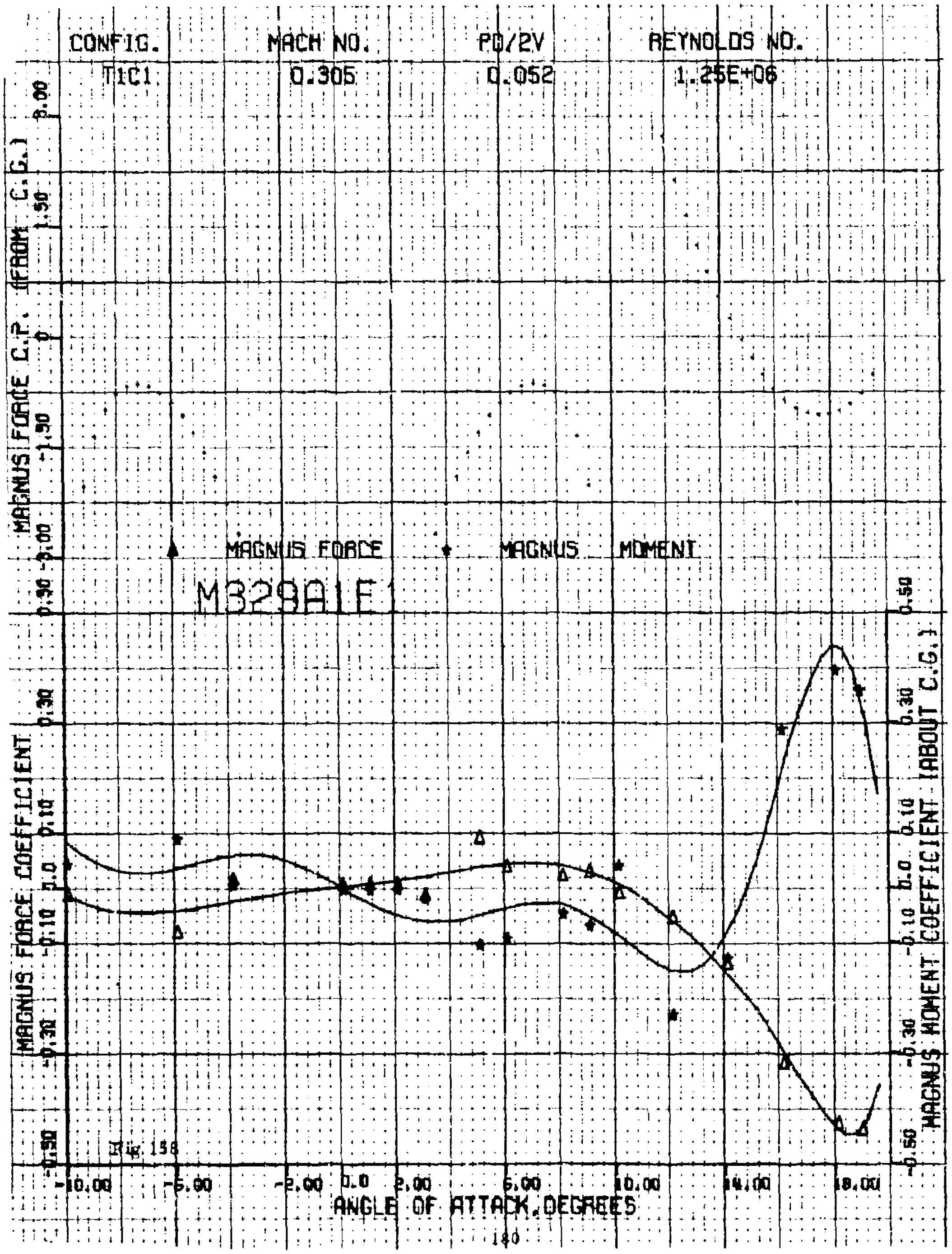
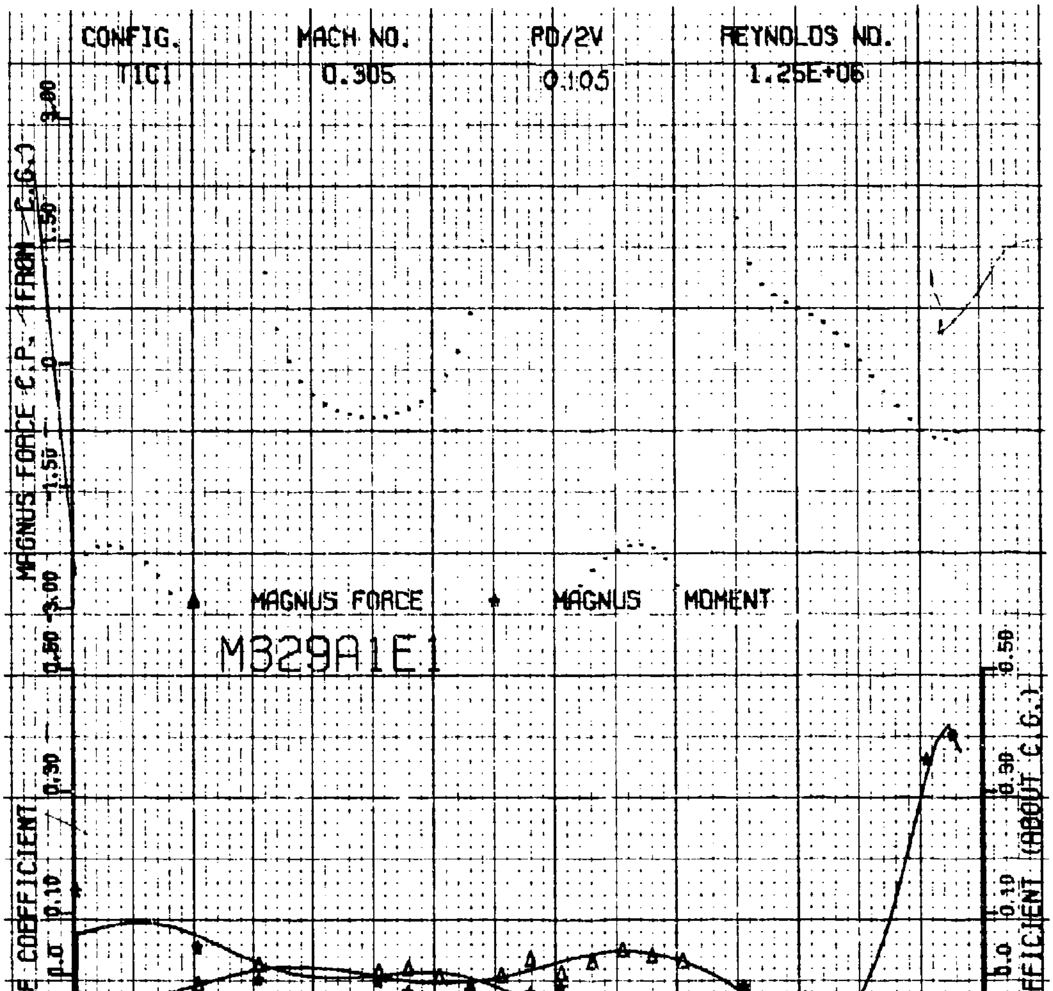
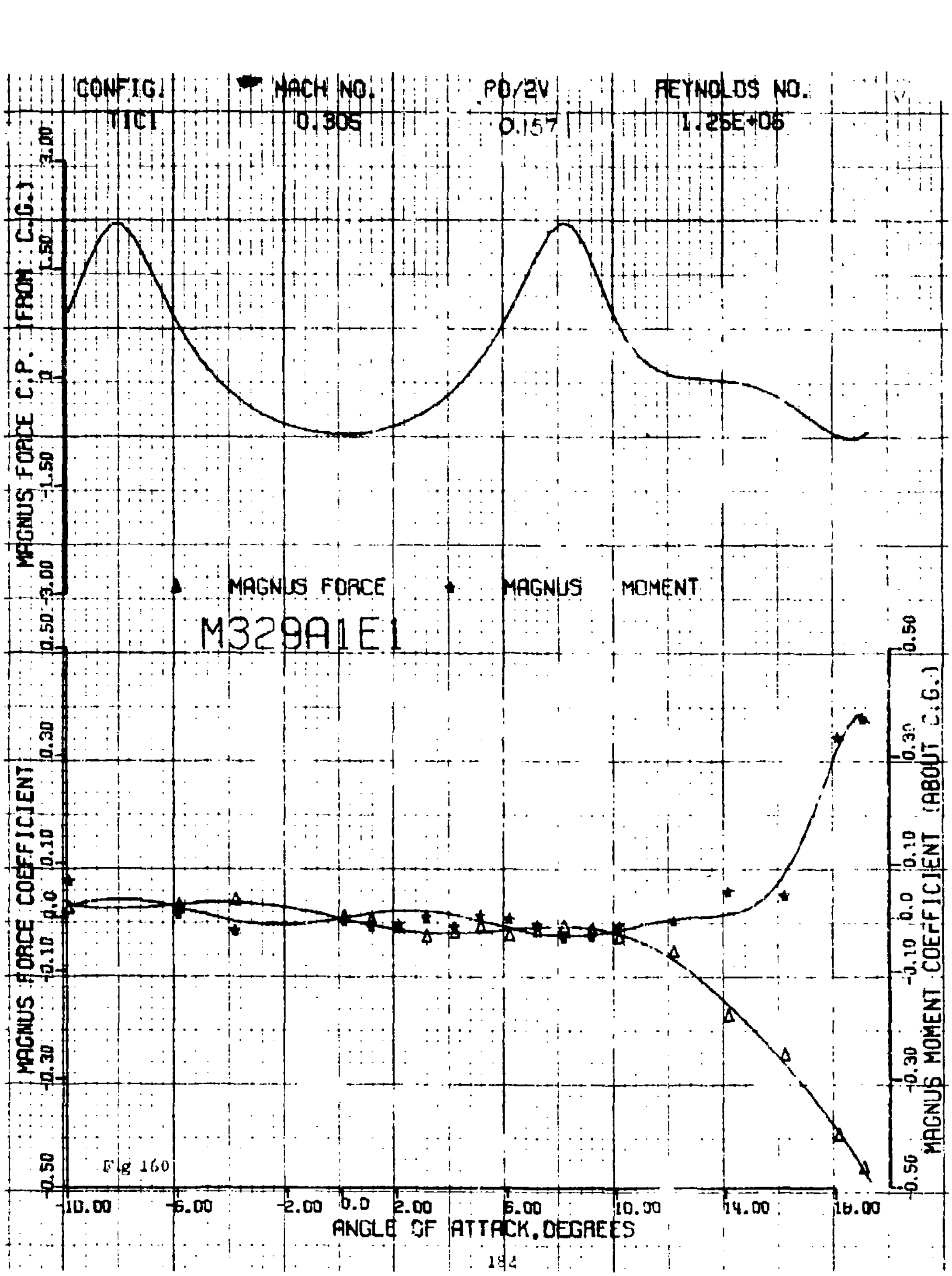


CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.052
REYNOLDS NO.
1.25E+06
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00

Fig. 156


CONFIG.
TIC1
MACH NO.
0.305
PD/2V
0.105
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 159


CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.157
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 160

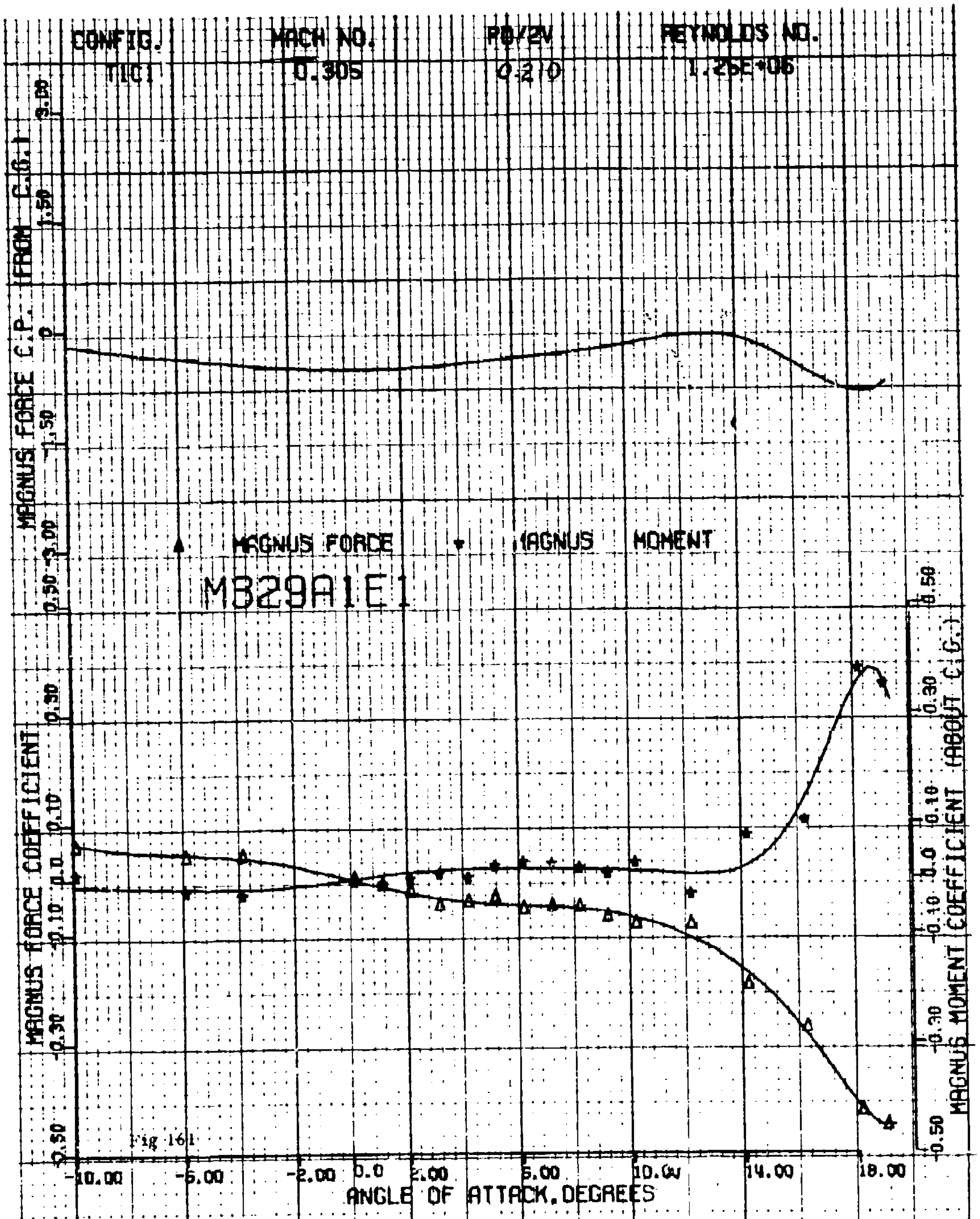
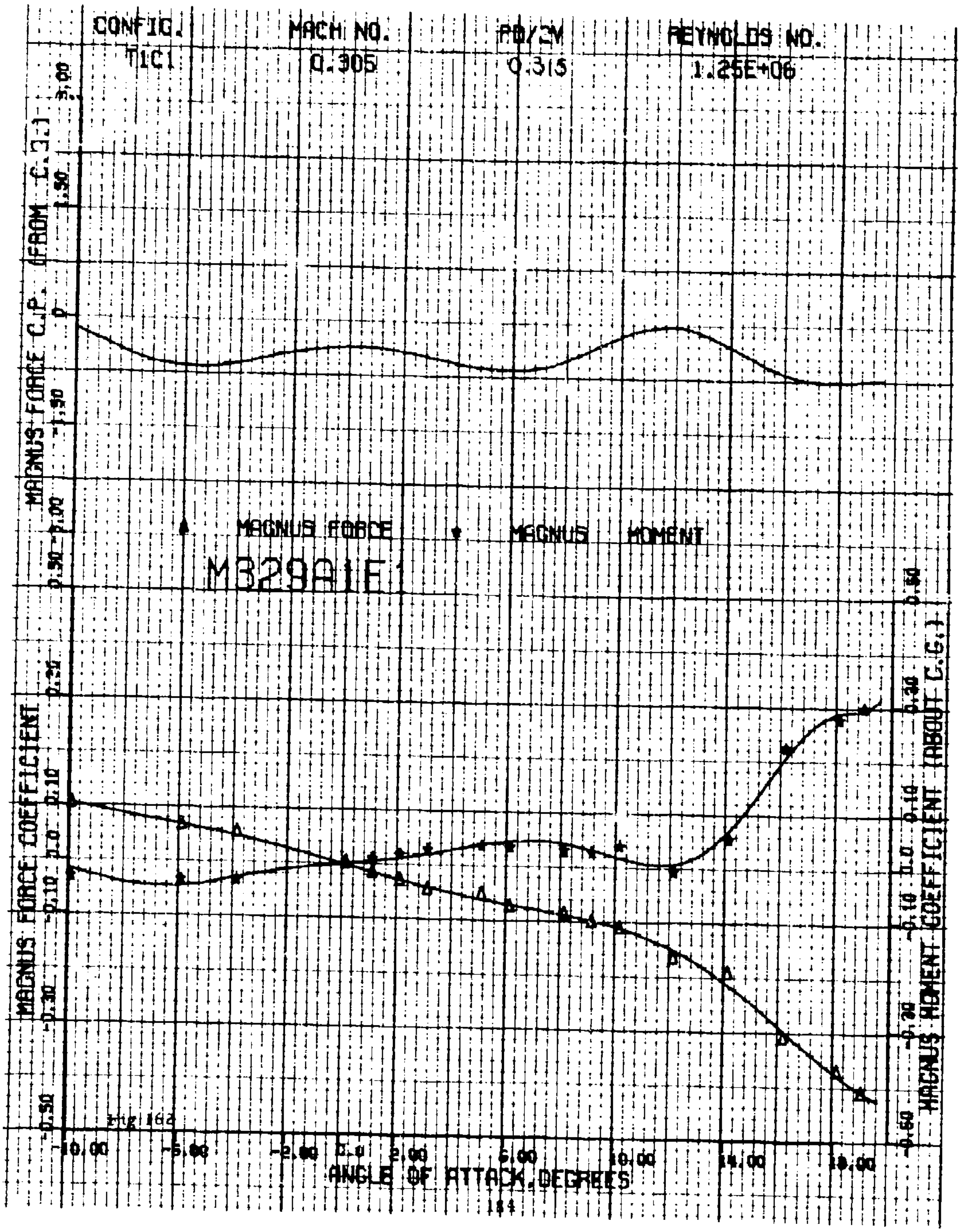
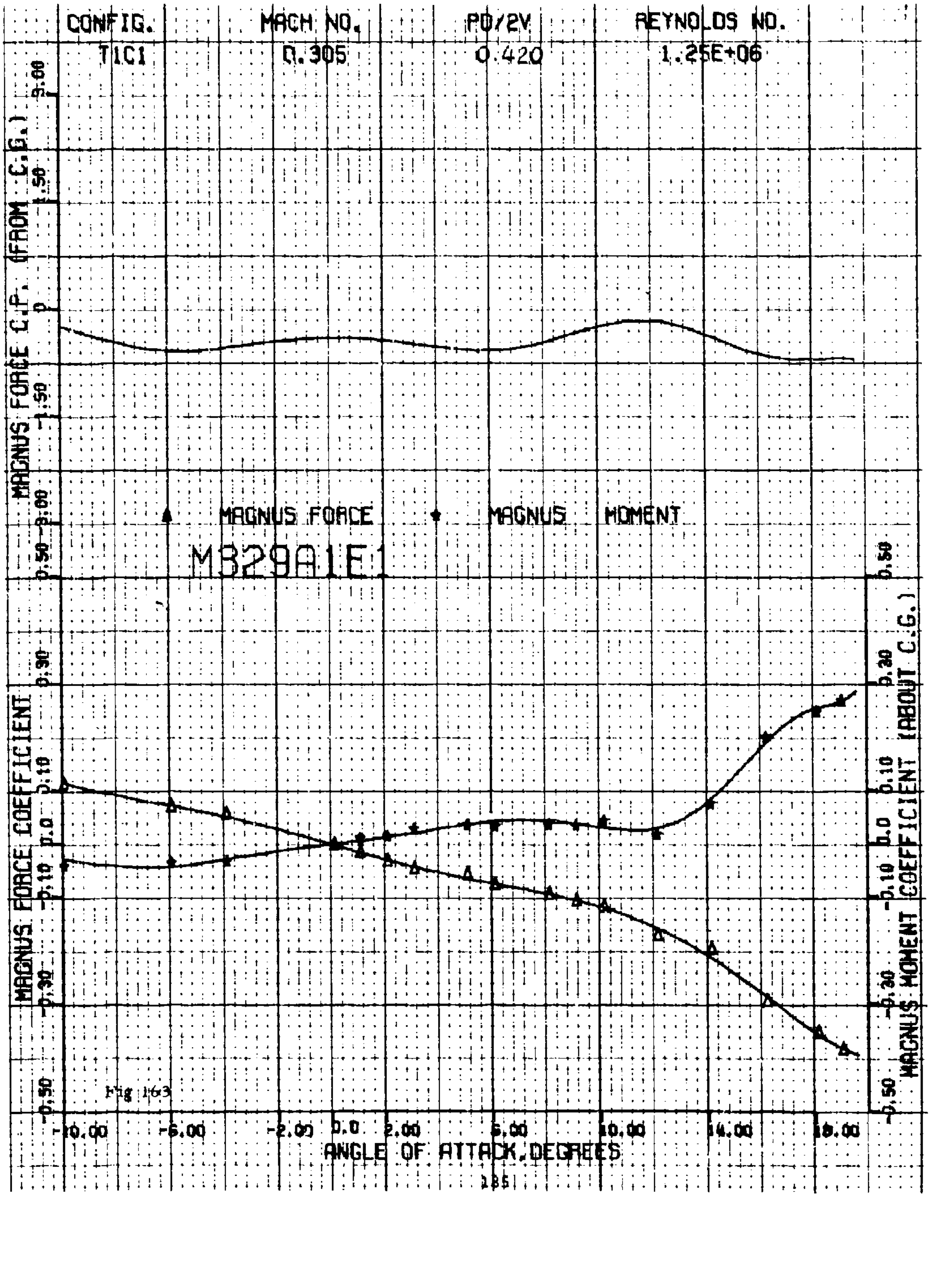
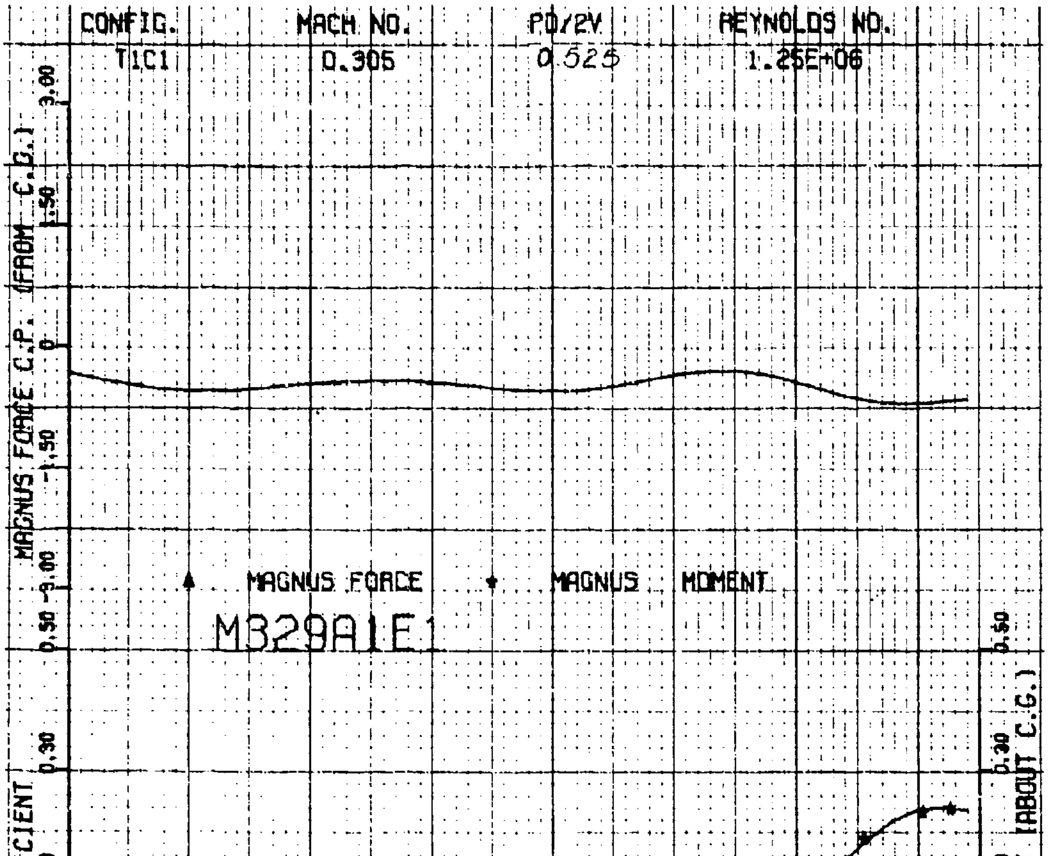
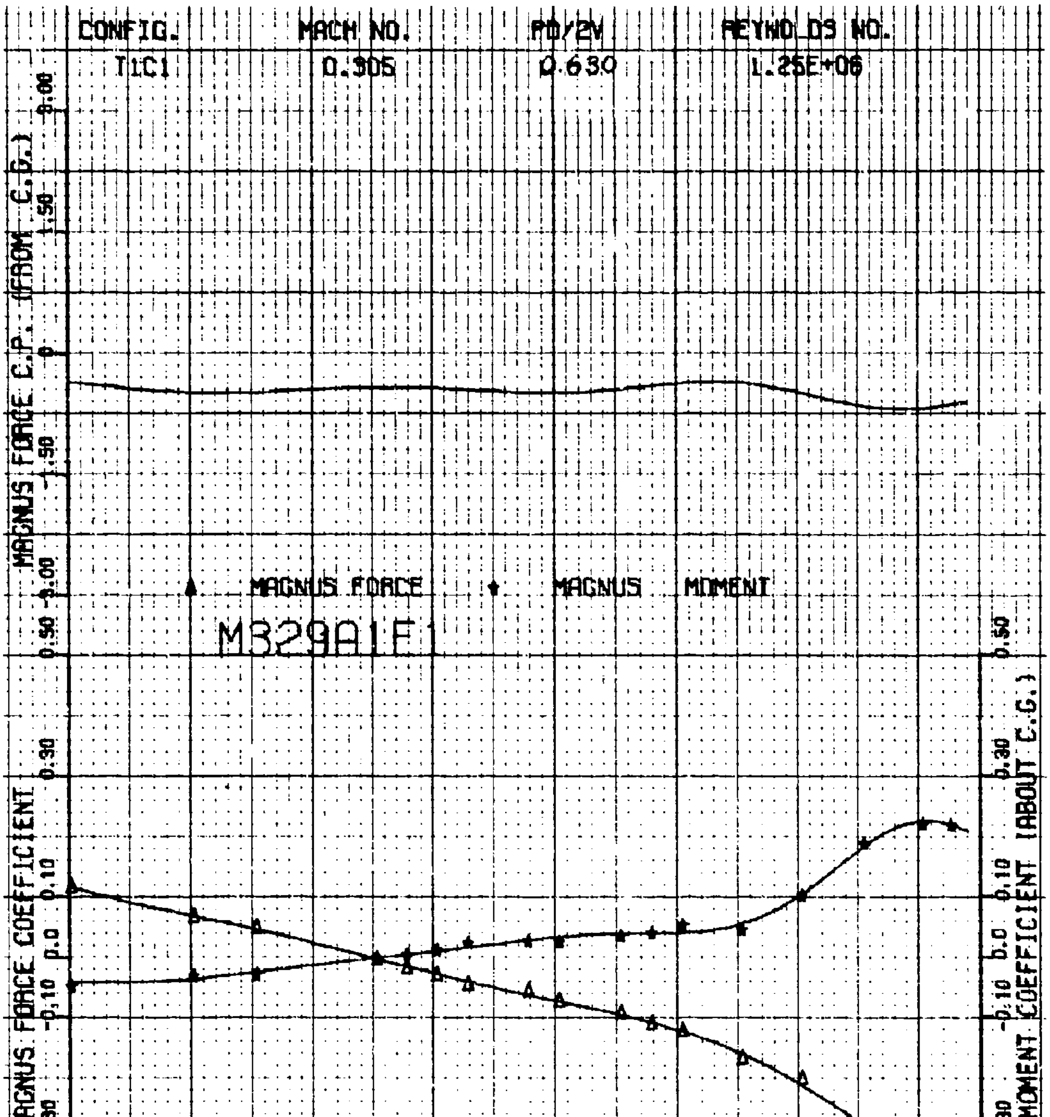

CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.210
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 161


CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.315
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 162


CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.420
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 163


CONFIG.
T1C1
MACH NO.
0.305
PD/2V
0.525
REYNOLDS NO.
1.25E+06
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
0.50
0.30
0.10
0.0
-0.10
-0.30
-0.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 164
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00
ANGLE OF ATTACK, DEGREES



CONFIG. T1C1
MACH NO. 0.305
PD/2V 0.630
REYNOLDS NO. 1.25E+06
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00

Fig 163

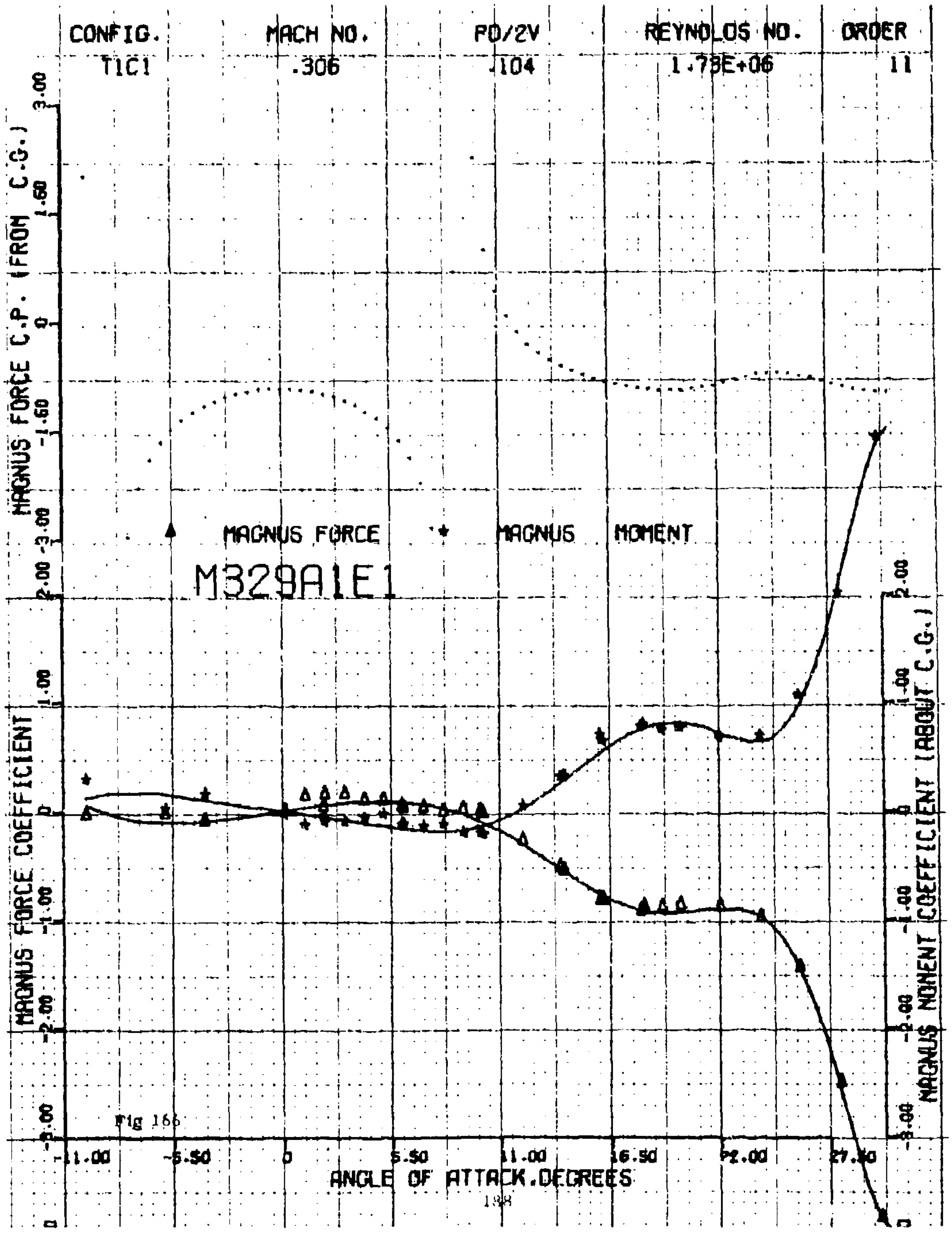
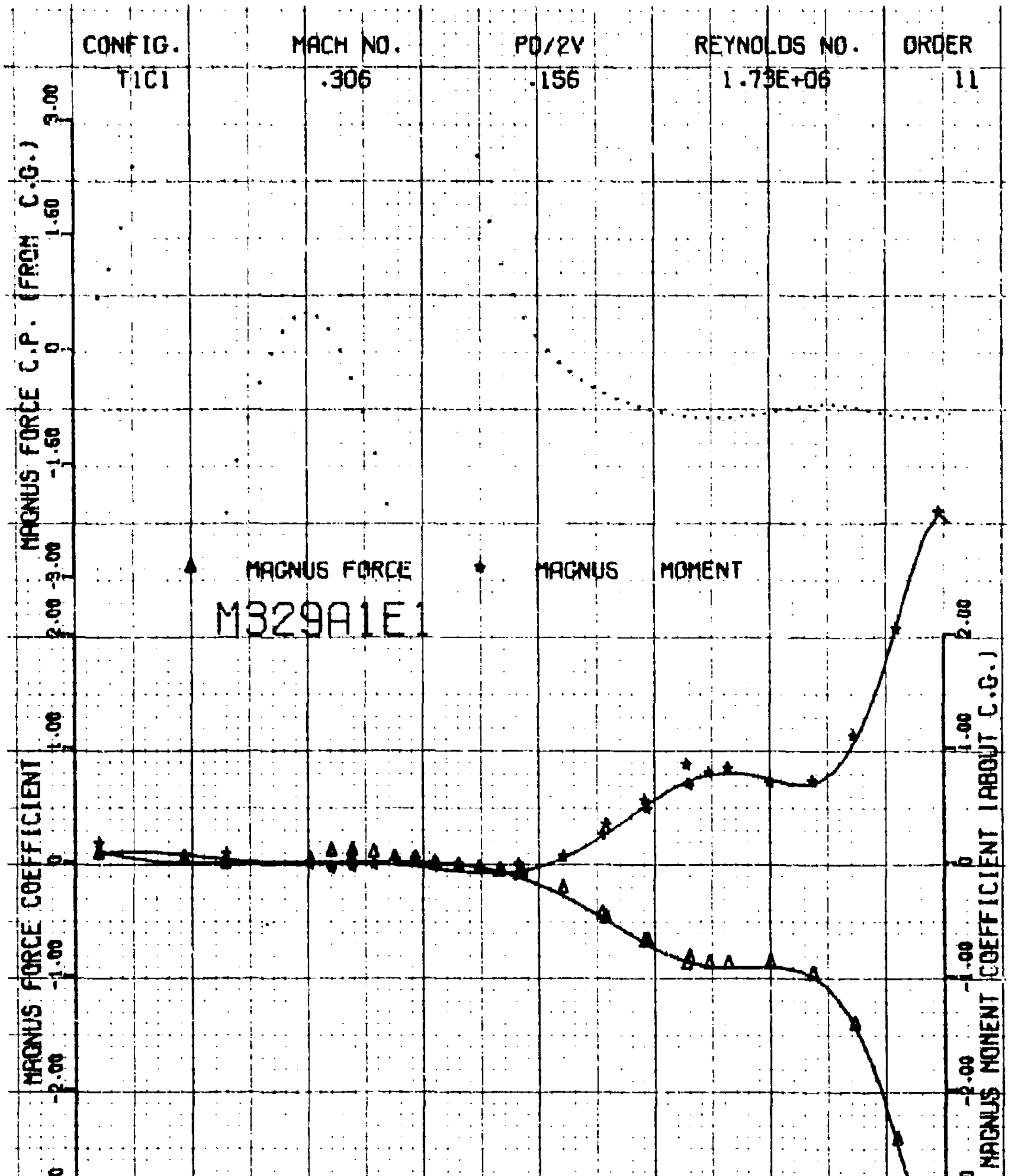
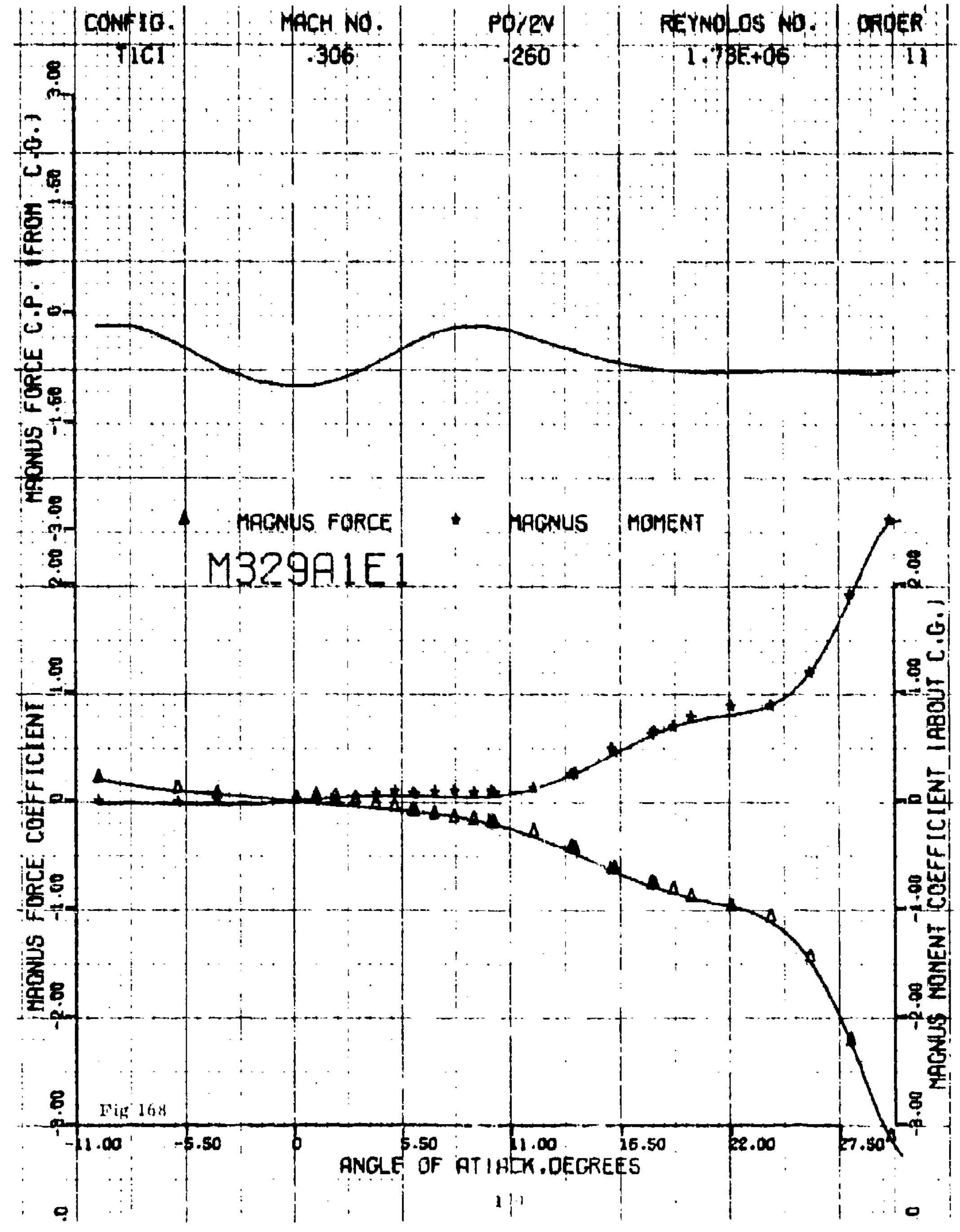

CONFIG. T1C1
MACH NO. .306
PD/2V .104
REYNOLDS NO. 1.73E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

Fig 166



CONFIG.
T1C1
MACH NO.
.306
PD/2V
.156
REYNOLDS NO.
1.73E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

Fig 167



CONFIG.
T1C1
MACH NO.
.306
PD/2V
.260
REYNOLDS NO.
1.78E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

Fig 168

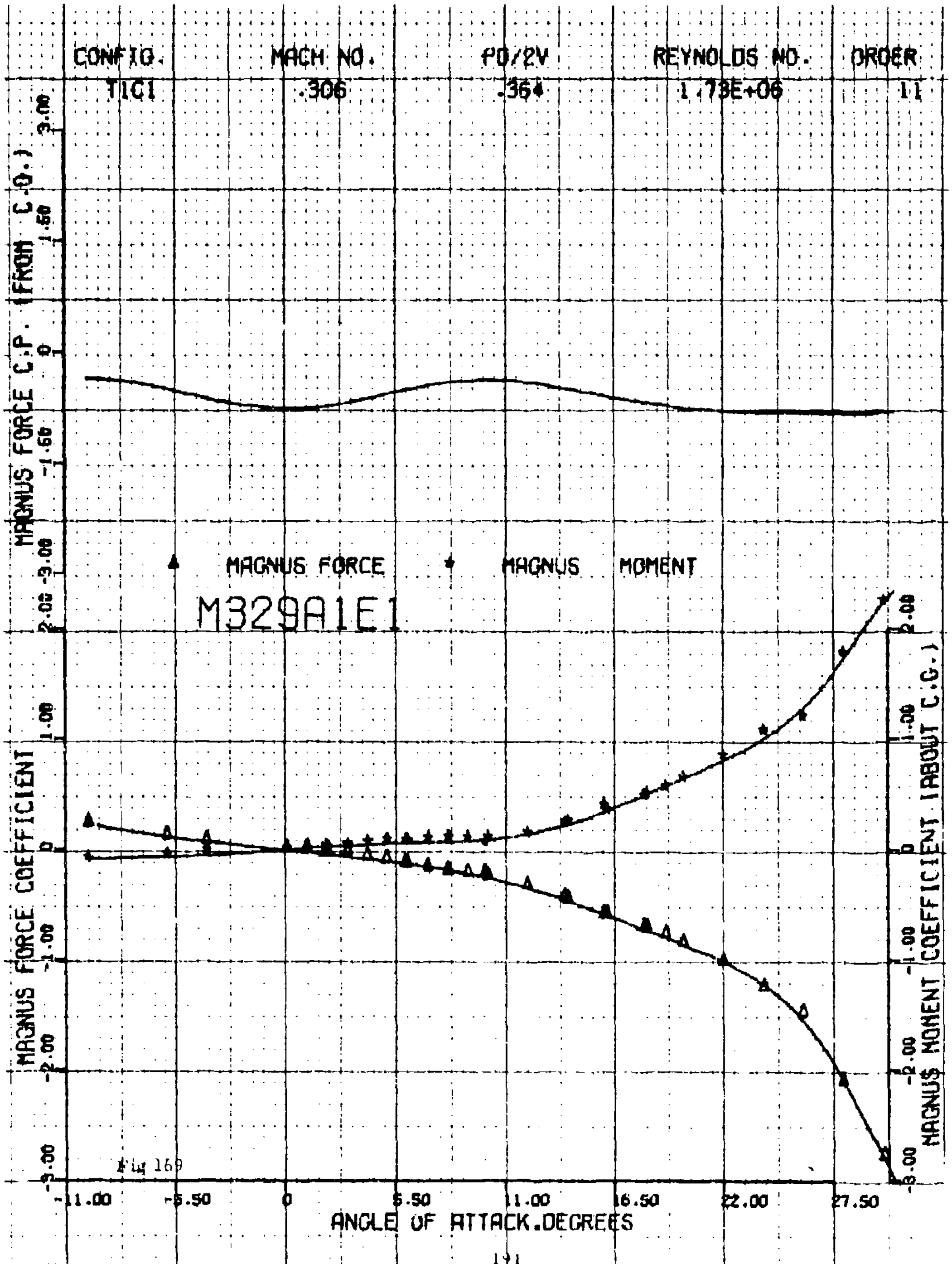

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 .306 .364 1.73E+06 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-11.00 -5.50 0 5.50 11.00 16.50 22.00 27.50
ANGLE OF ATTACK, DEGREES

Fig 169

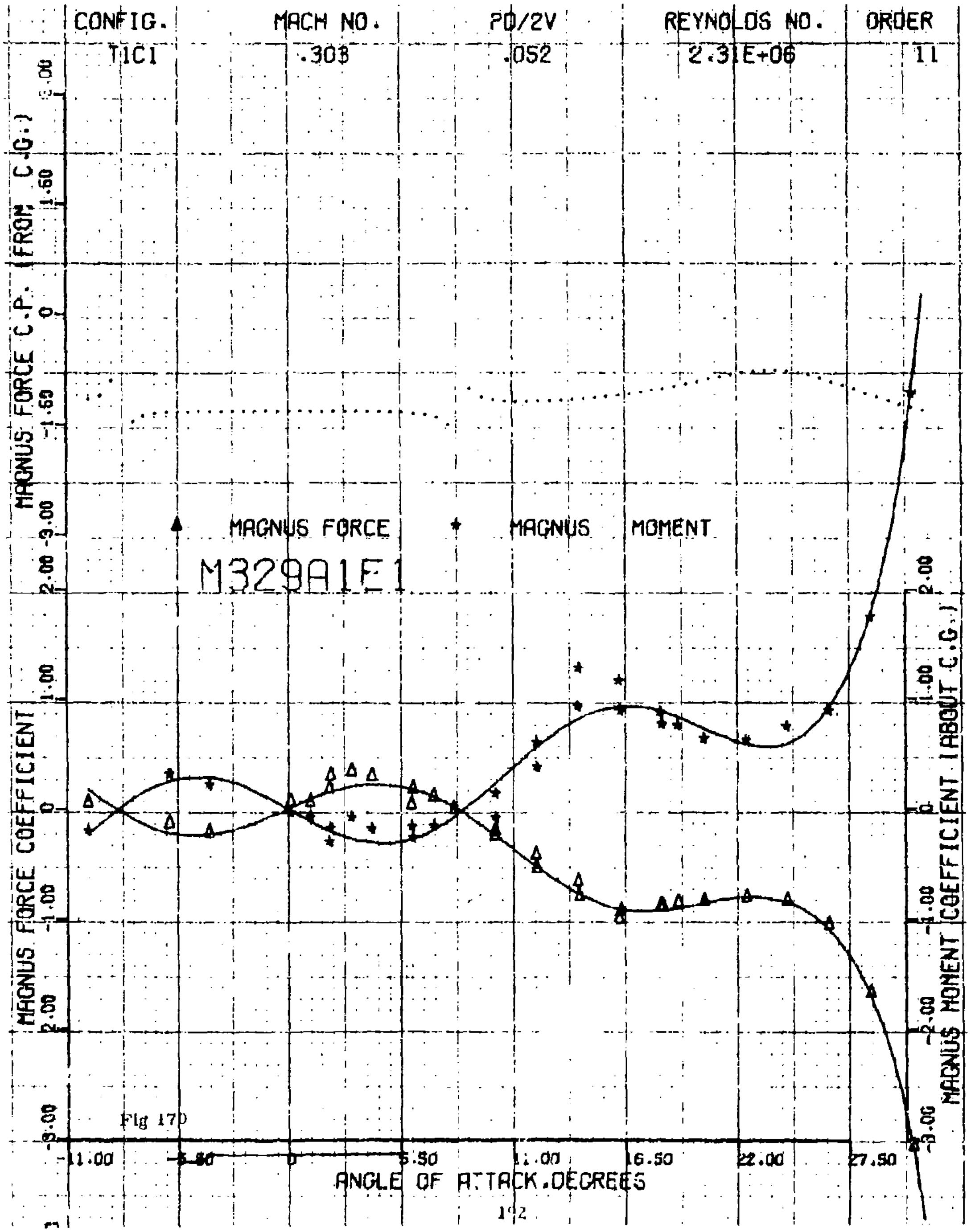
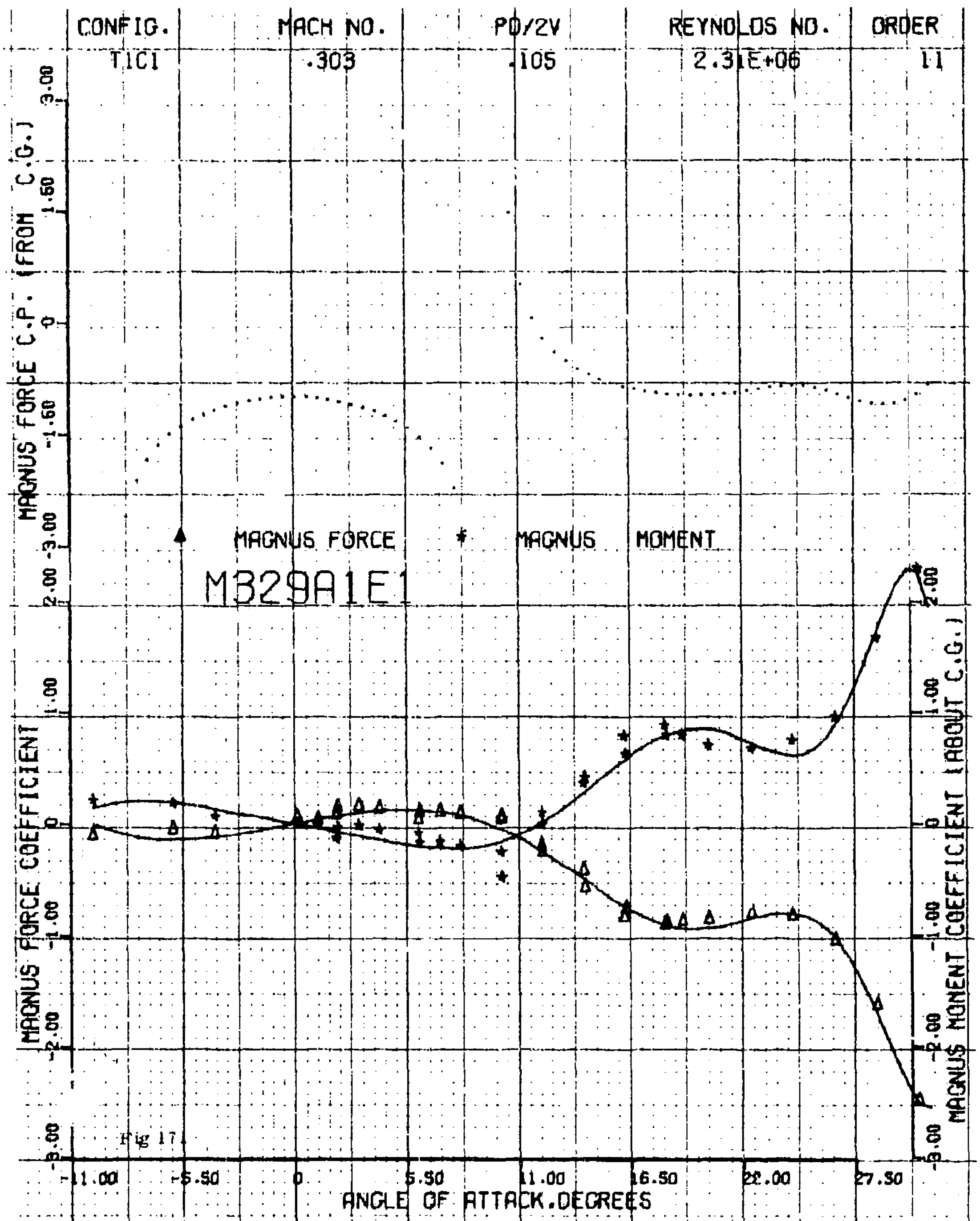
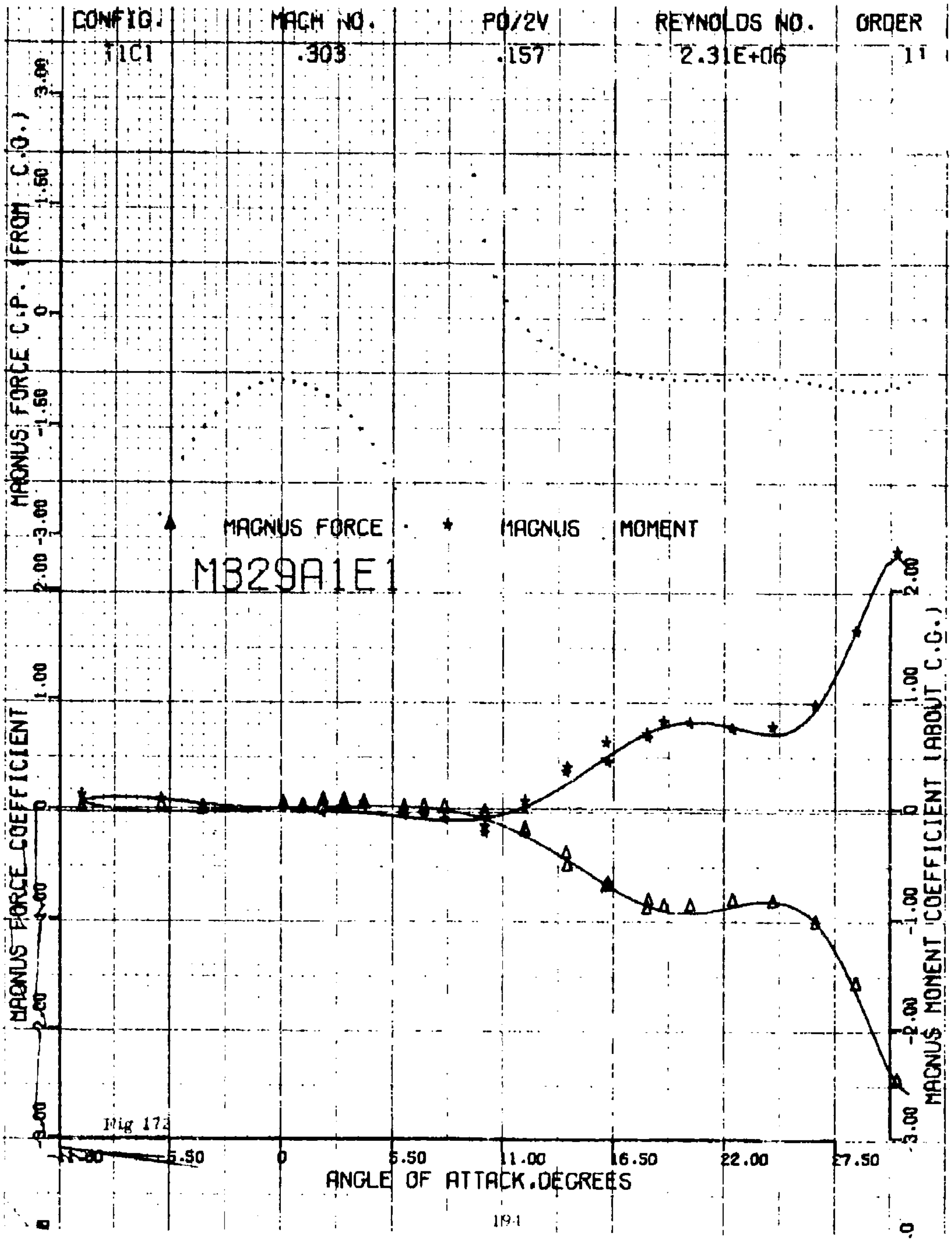

CONFIG.
T1C1
MACH NO.
.303
PD/2V
.052
REYNOLDS NO.
2.31E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50

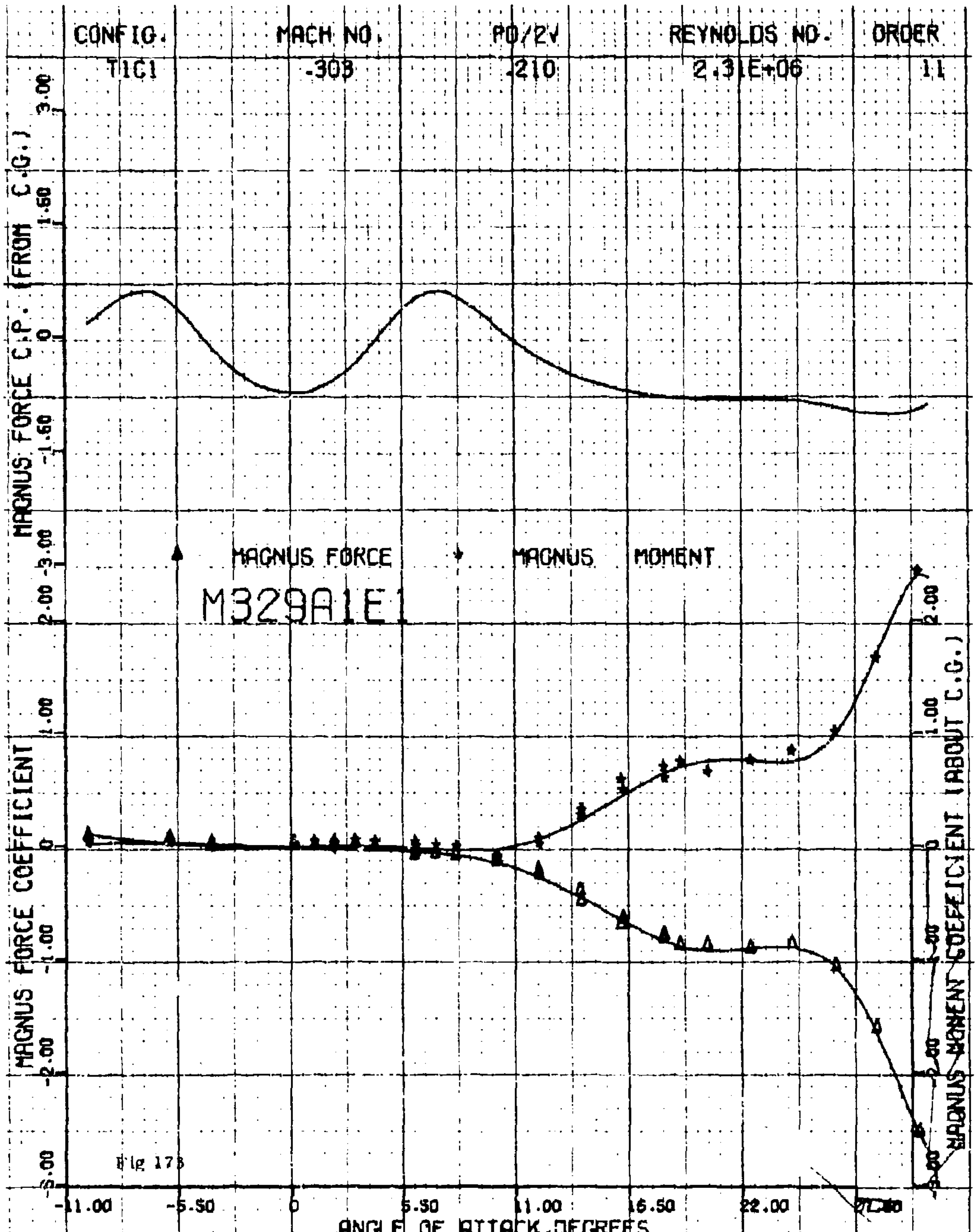
Fig 170



CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 .303 .105 2.31E+06 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
3.00
1.50
0
-1.50
-3.00
2.00
1.00
-1.00
-2.00
-3.00

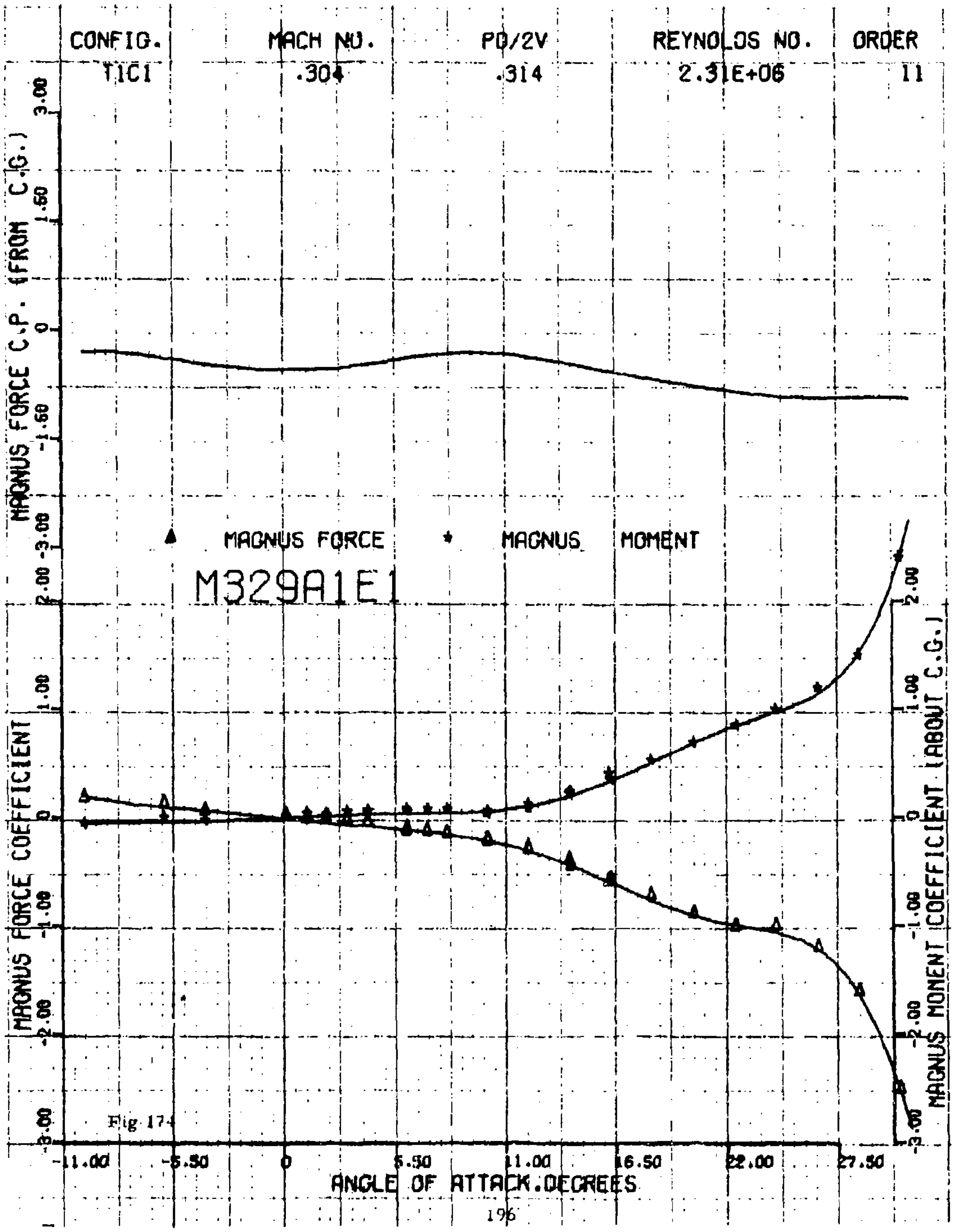
Fig 17


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C1
.303
.157
2.31E+06
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-5.50
0
5.50
11.00
16.50
22.00
27.50
Fig 173



CONFIG.
T1C1
MACH NO.
.303
PD/2V
.210
REYNOLDS NO.
2.31E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
2.00
1.00
0
-1.00
-2.00
-3.00
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
16.50
22.00
ANGLE OF ATTACK, DEGREES

Fig 17B



CONFIG.
T1C1
MACH NO.
.304
PD/2V
.314
REYNOLDS NO.
2.31E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
2.00
1.00
0
-1.00
-2.00
-3.00
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
ANGLE OF ATTACK.DEGREES

Fig 174

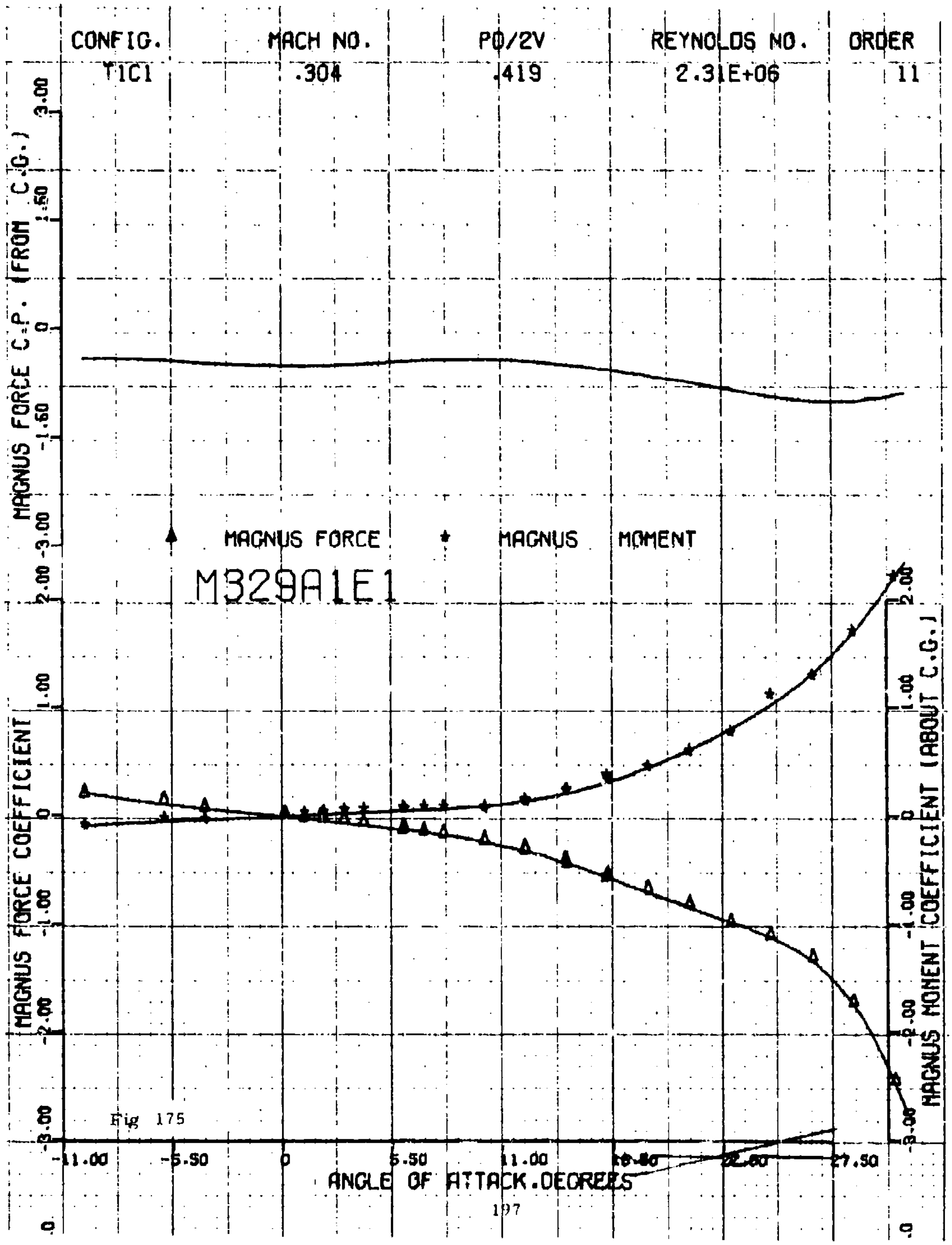
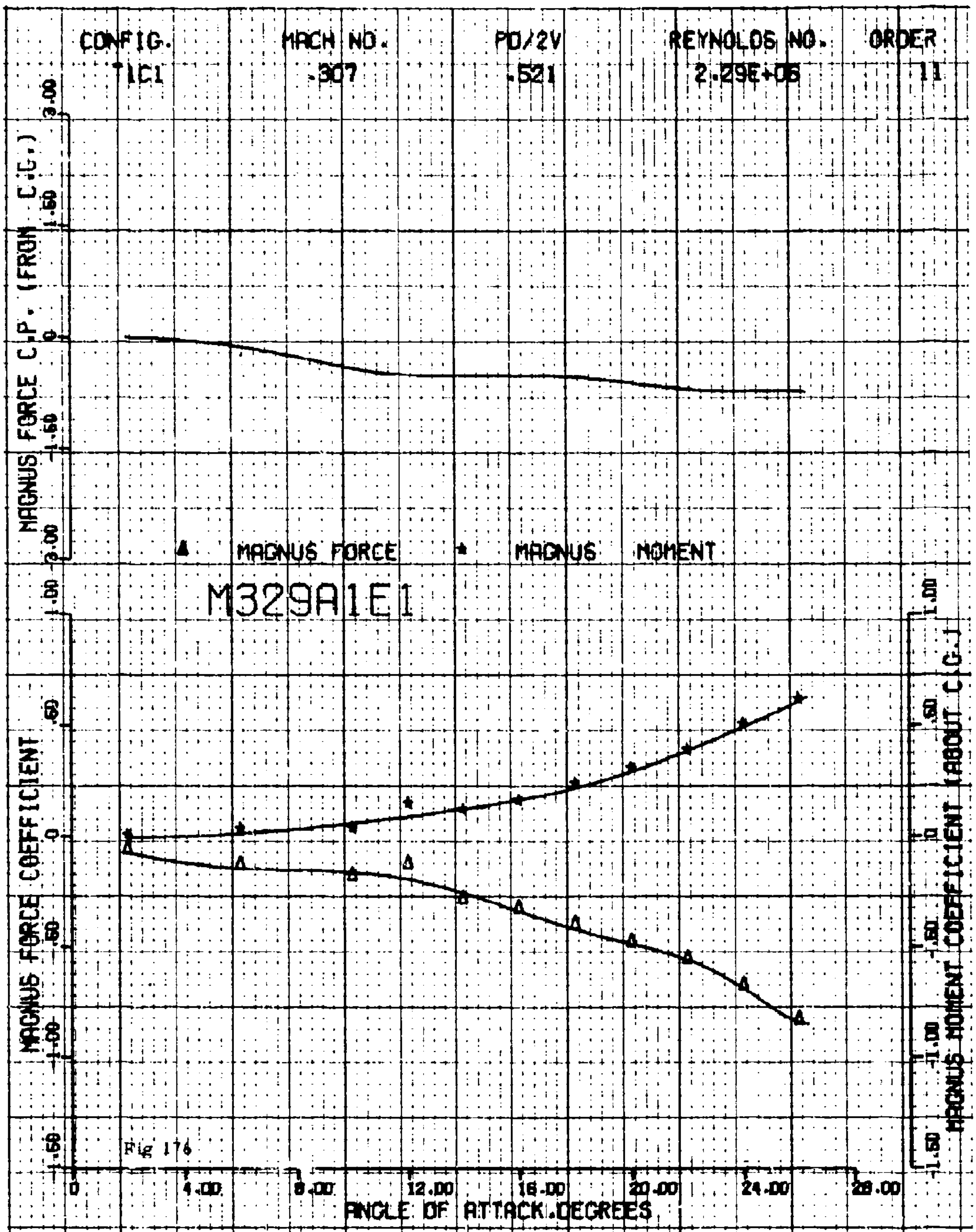
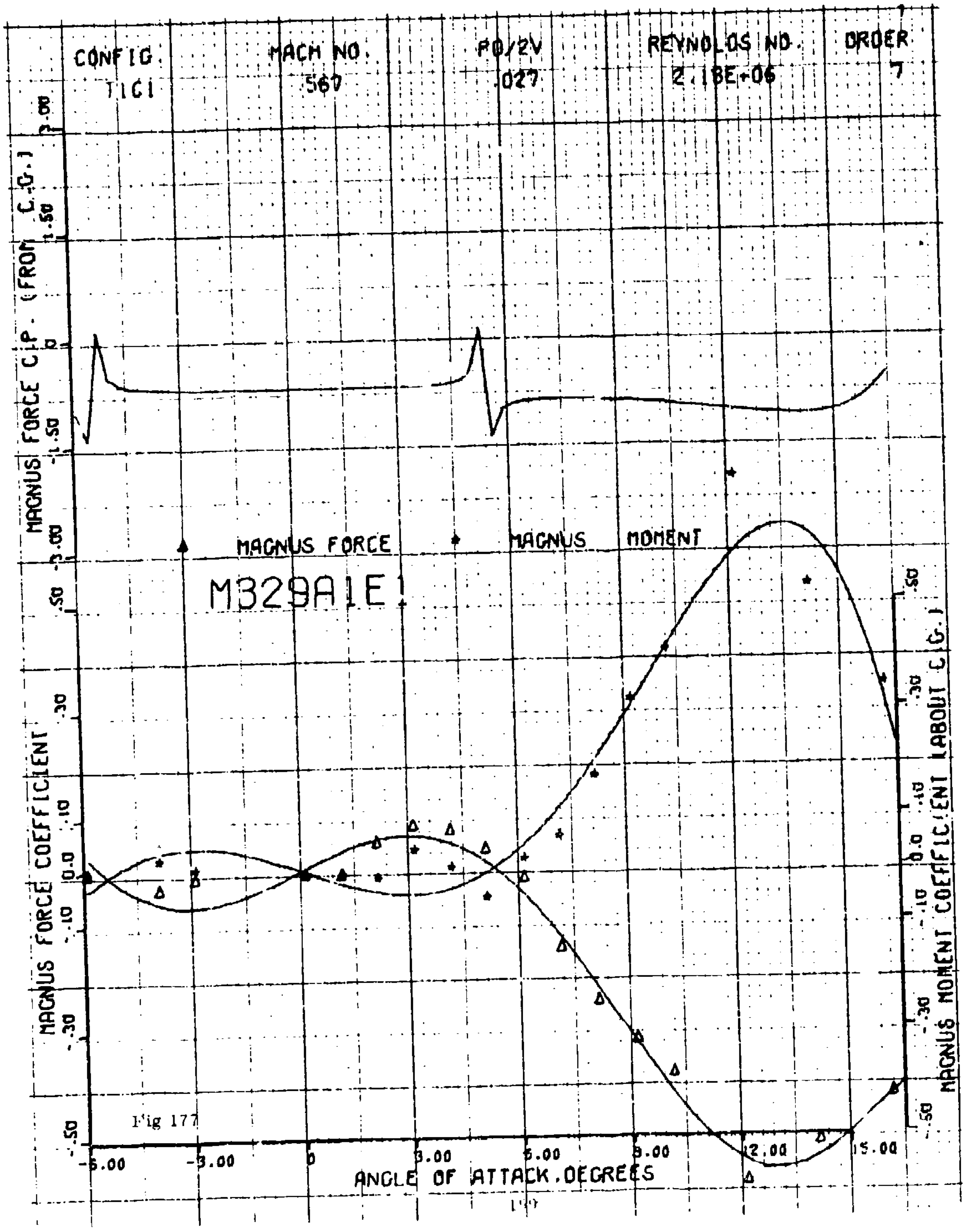

CONFIG.
T1C1
MACH NO.
.304
PD/2V
.419
REYNOLDS NO.
2.31E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
2.00
1.00
0
-1.00
-2.00
-3.00
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
22.00
27.50
ANGLE OF ATTACK,DEGREES

Fig 175


CONFIG. TIC1
MACH NO. .307
PD/2V .521
REYNOLDS NO. 2.29E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
▲ MAGNUS FORCE
* MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
1.00
.50
0
-.50
-1.00
-1.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 176
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00
ANGLE OF ATTACK,DEGREES


CONFIG
T1C1
MACH NO.
.567
PD/2V
.027
REYNOLDS NO.
2.18E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
Fig 177

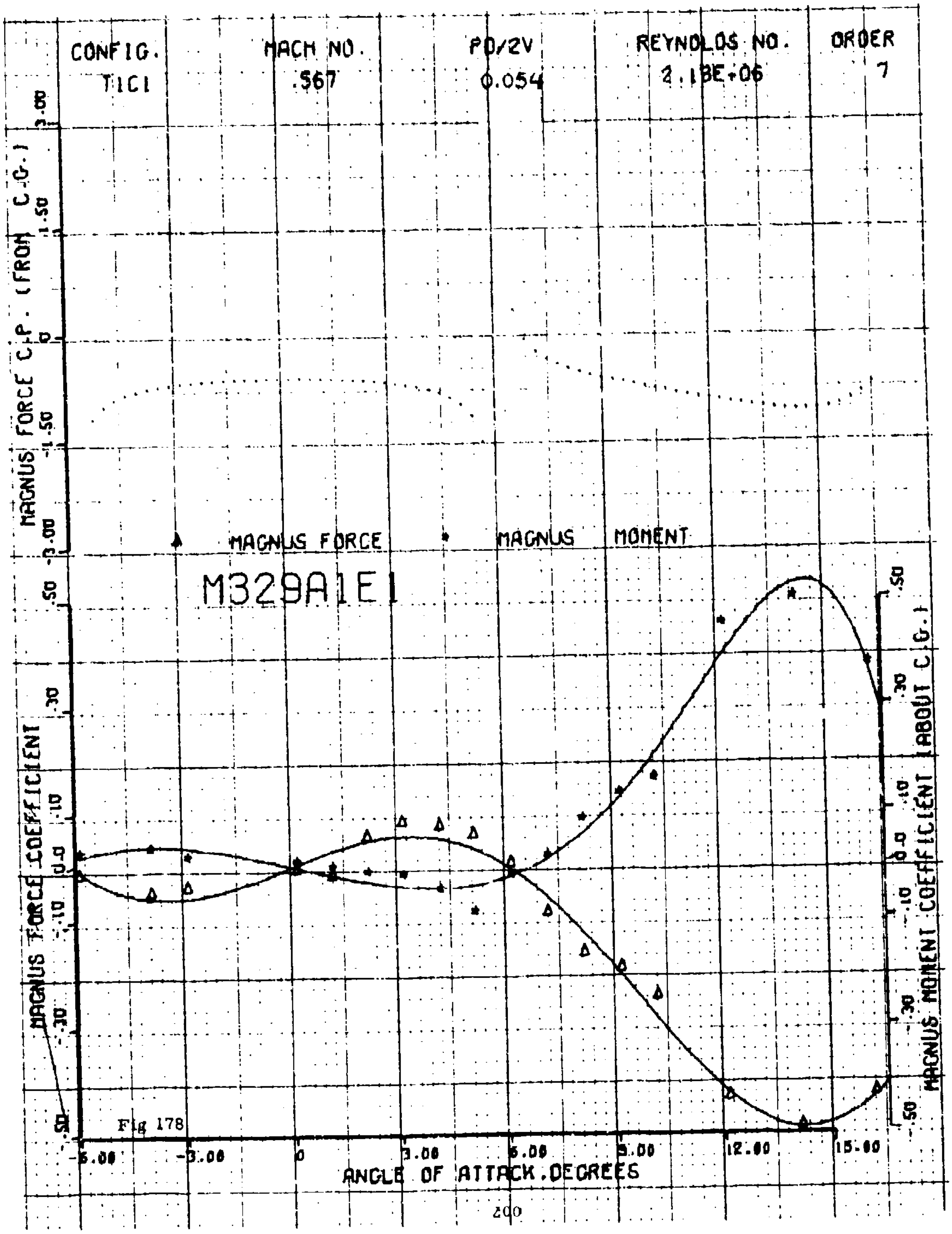

CONFIG.
T1C1
MACH NO.
.567
PD/2V
0.054
REYNOLDS NO.
2.18E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 178

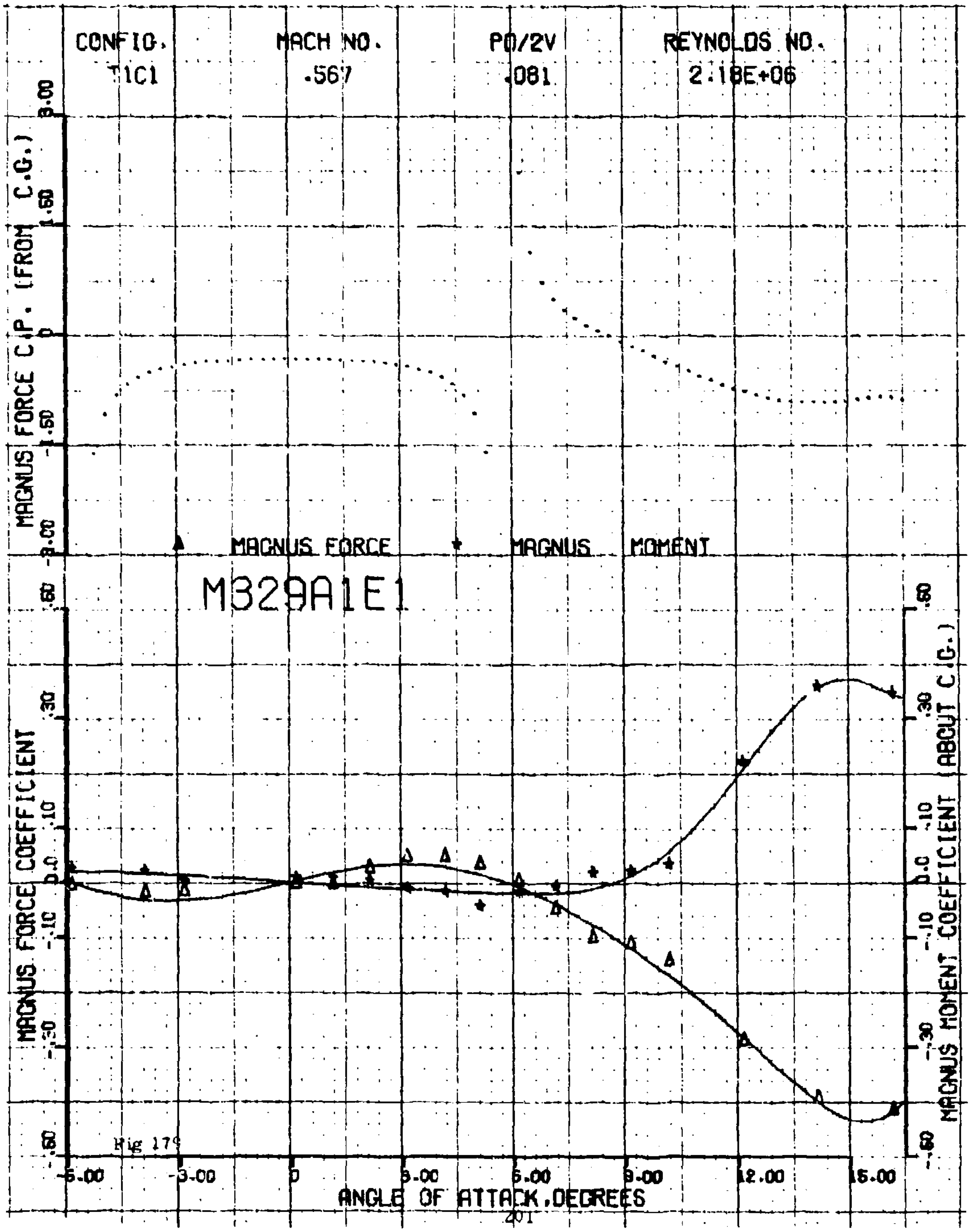
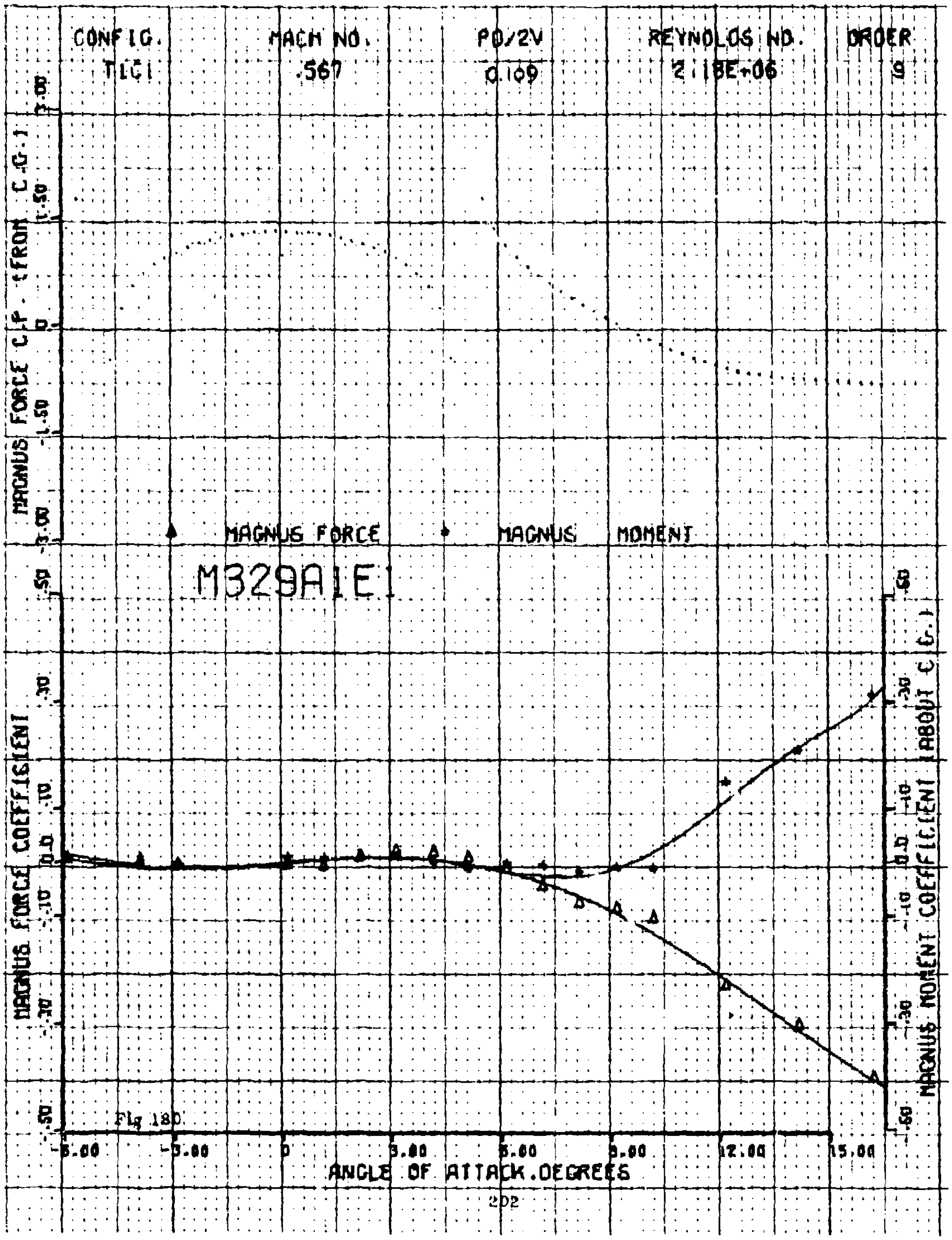
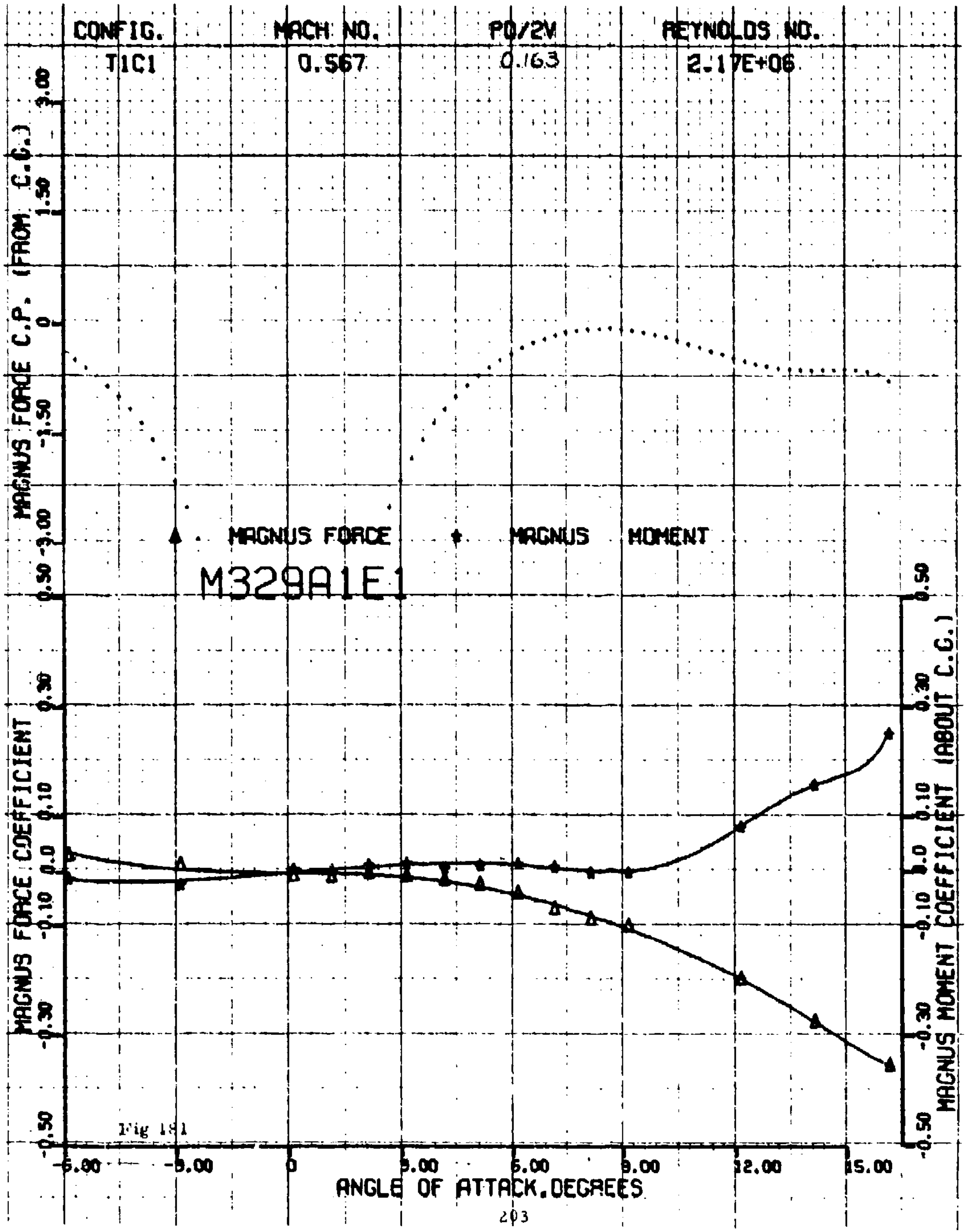

CONFIG.
T1C1
MACH NO.
.567
PD/2V
.081
REYNOLDS NO.
2.18E+06
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.60
.30
.10
0.0
-.10
-.30
-.60
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

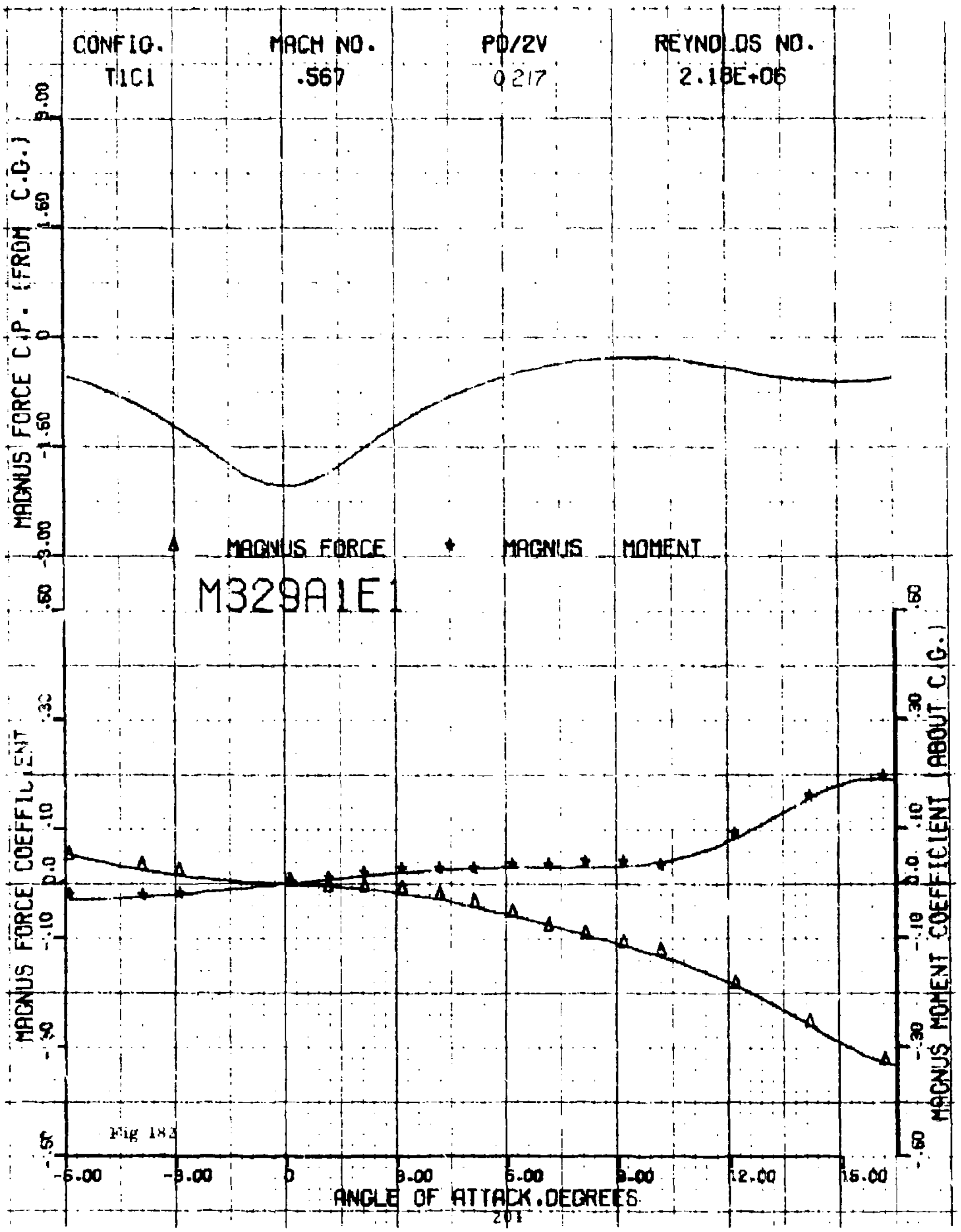
Fig 179


CONFIG.
T1C1
MACH NO.
.567
PD/2V
0.169
REYNOLDS NO.
2.18E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
Fig 180



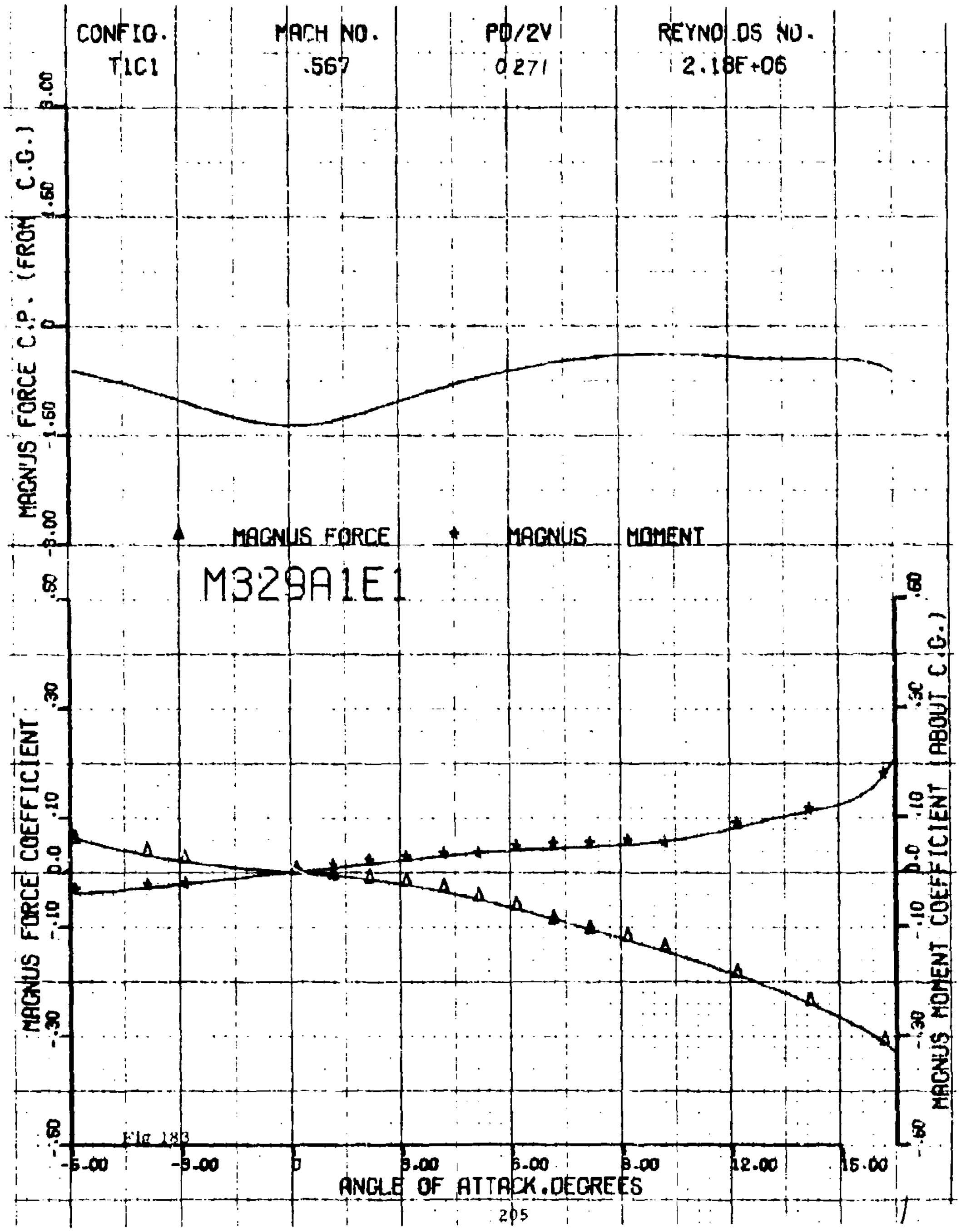
CONFIG.
T1C1
MACH NO.
0.567
PD/2V
0.163
REYNOLDS NO.
2.17E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

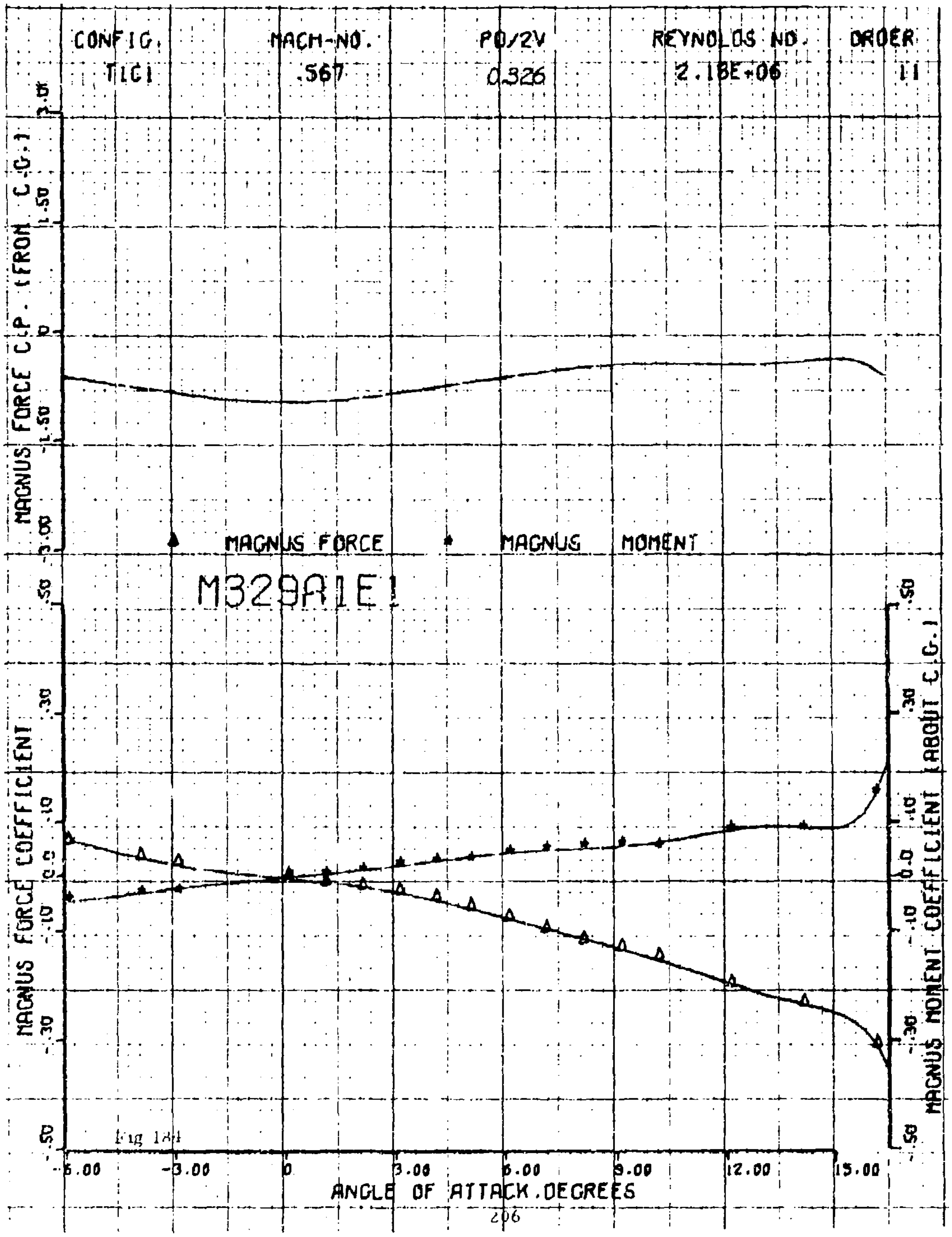
Fig 181



CONFIG.
T1C1
MACH NO.
.567
PD/2V
0.217
REYNOLDS NO.
2.18E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

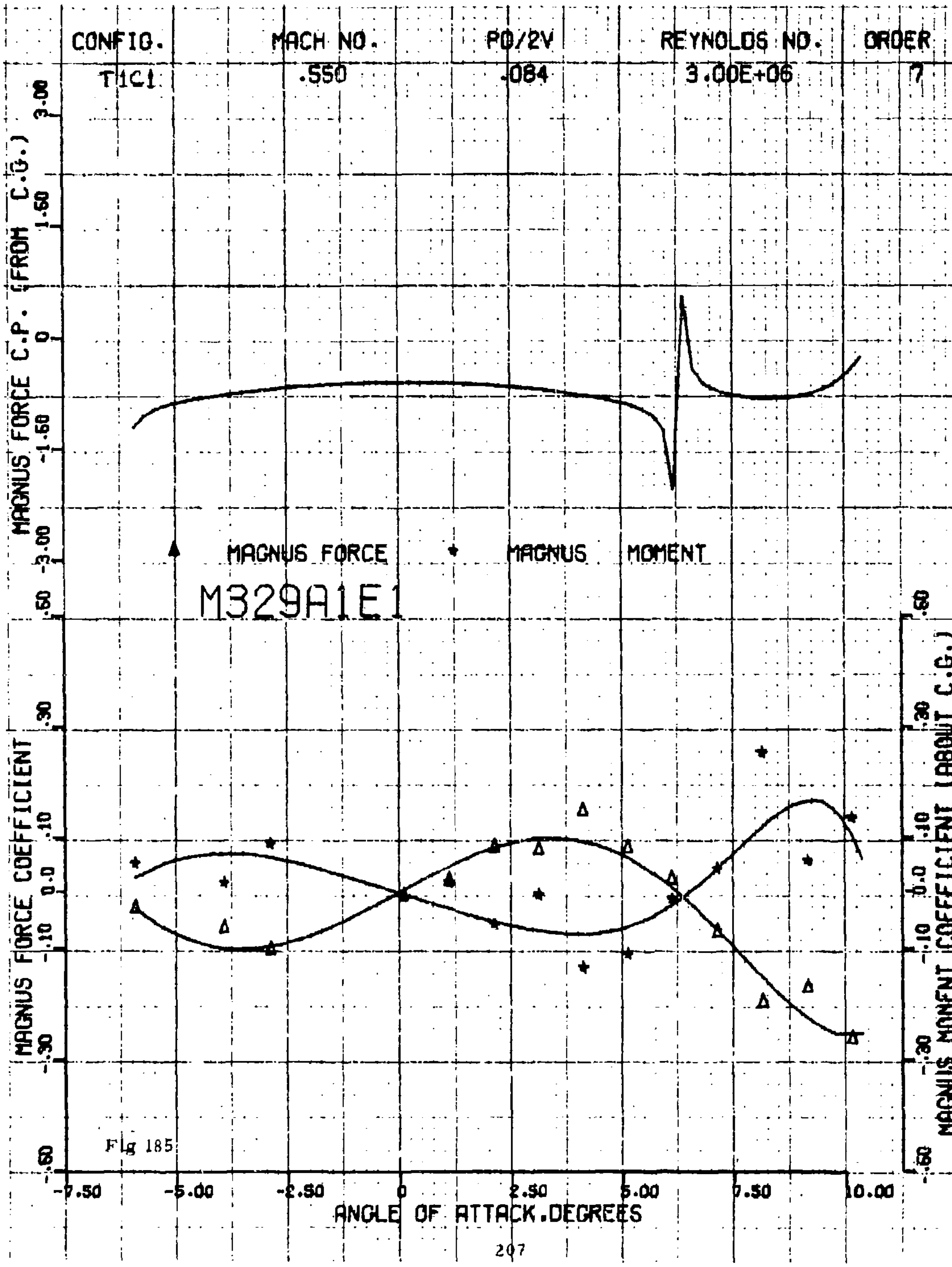
Fig 183


CONFIG. T1C1
MACH NO. .567
PD/2V 0.271
REYNOLDS NO. 2.18E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
Fig 183



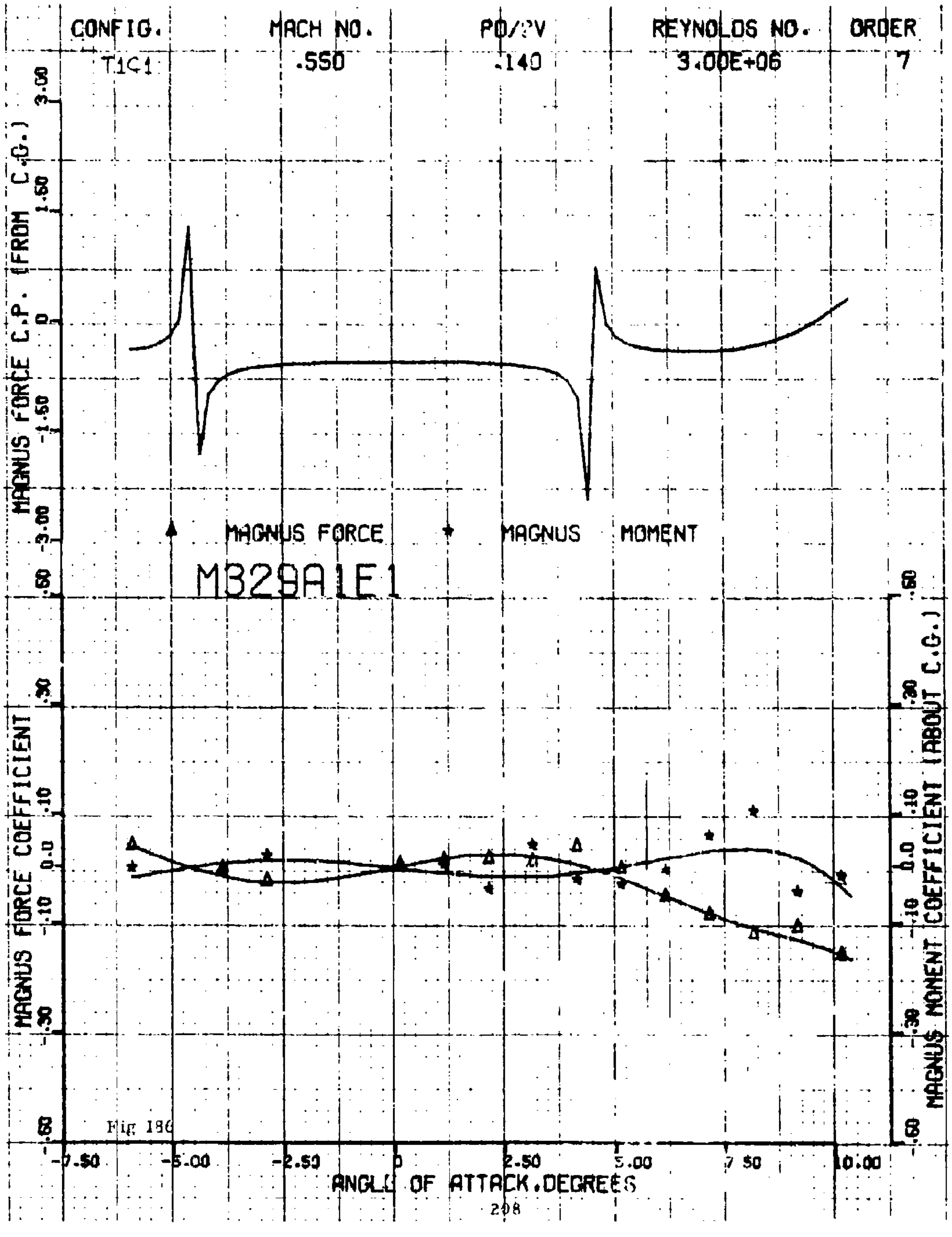
CONFIG. T1C1
MACH-NO. .567
PD/2V 0.326
REYNOLDS NO. 2.18E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 184



CONFIG.
T1C1
MACH NO.
.550
PD/2V
.084
REYNOLDS NO.
3.00E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.60
.30
.10
0.0
-.10
-.30
-.60
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 185



CONFIG.
T1C1
MACH NO.
.550
PD/2V
.140
REYNOLDS NO.
3.00E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 186

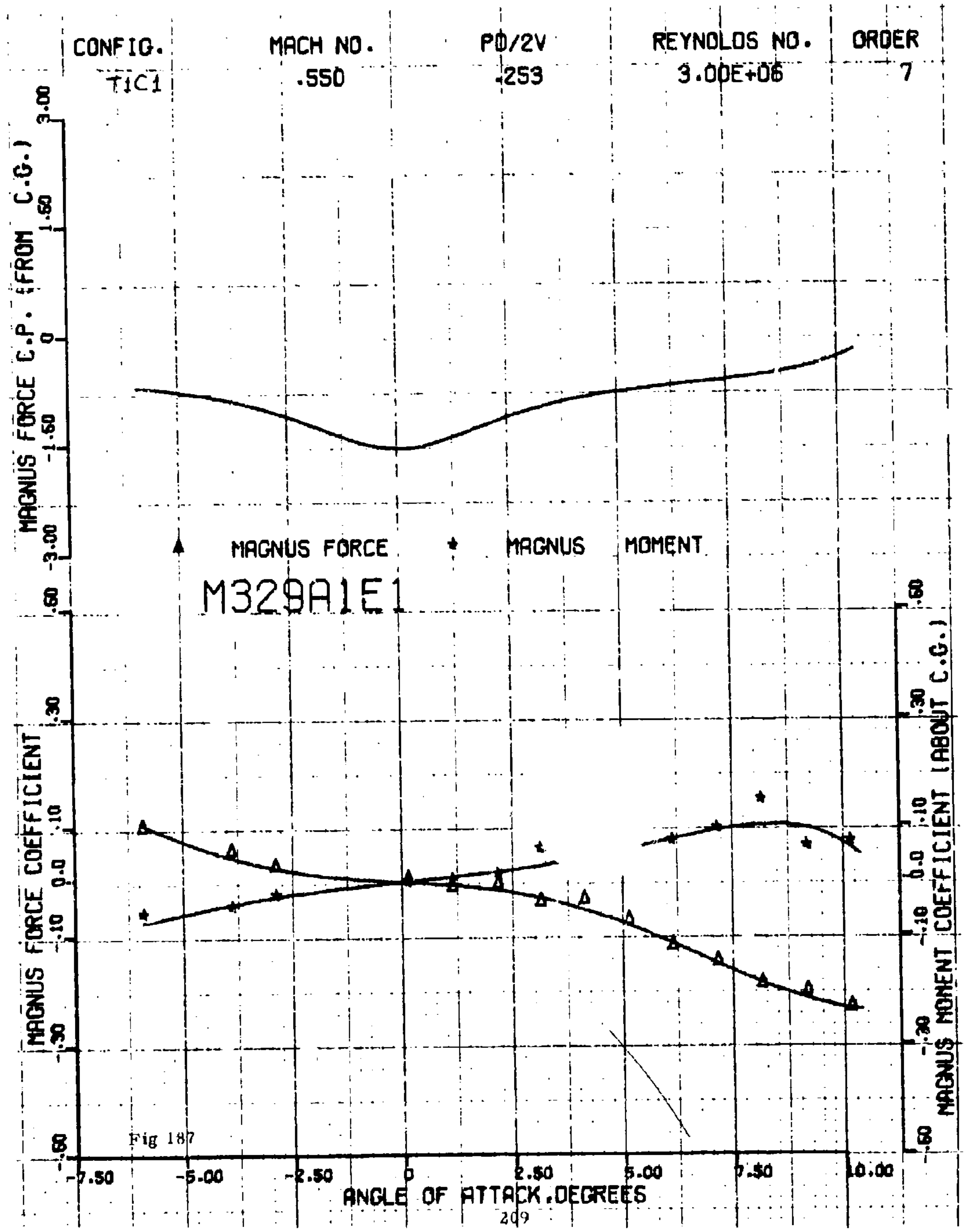
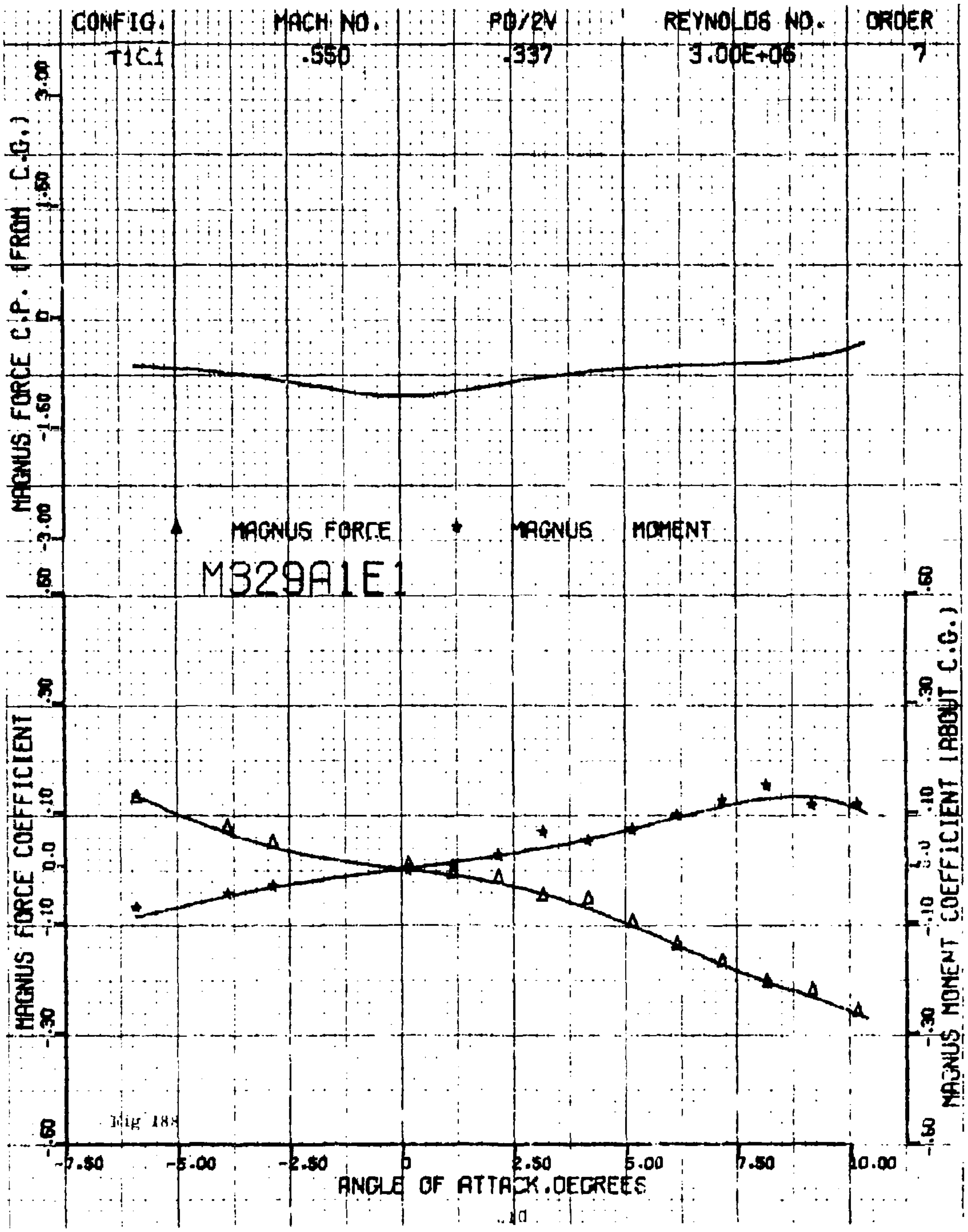
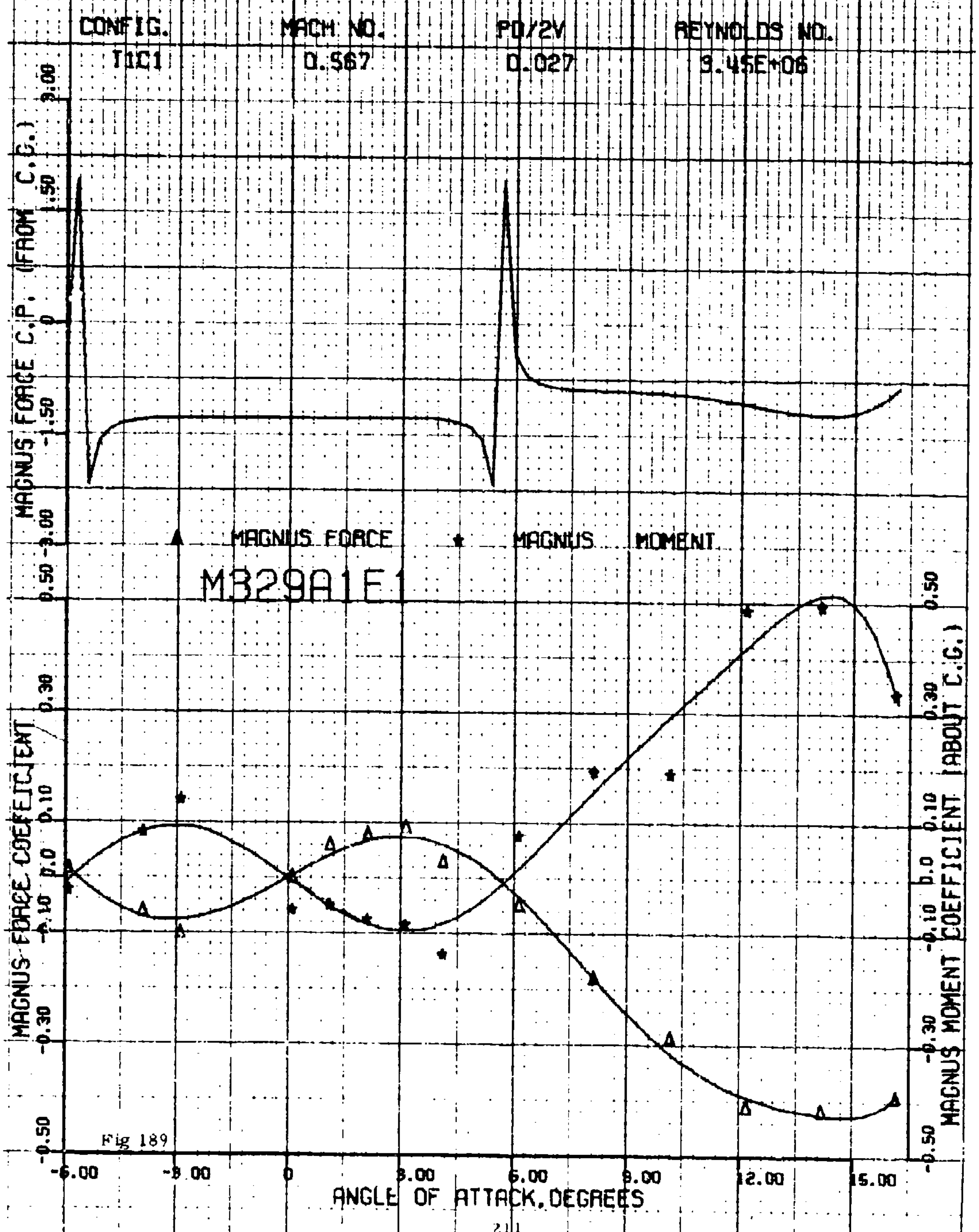

CONFIG.
TIC1
MACH NO.
.550
PD/2V
.253
REYNOLDS NO.
3.00E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.60
.30
.10
0.0
-.10
-.30
-.60
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 187



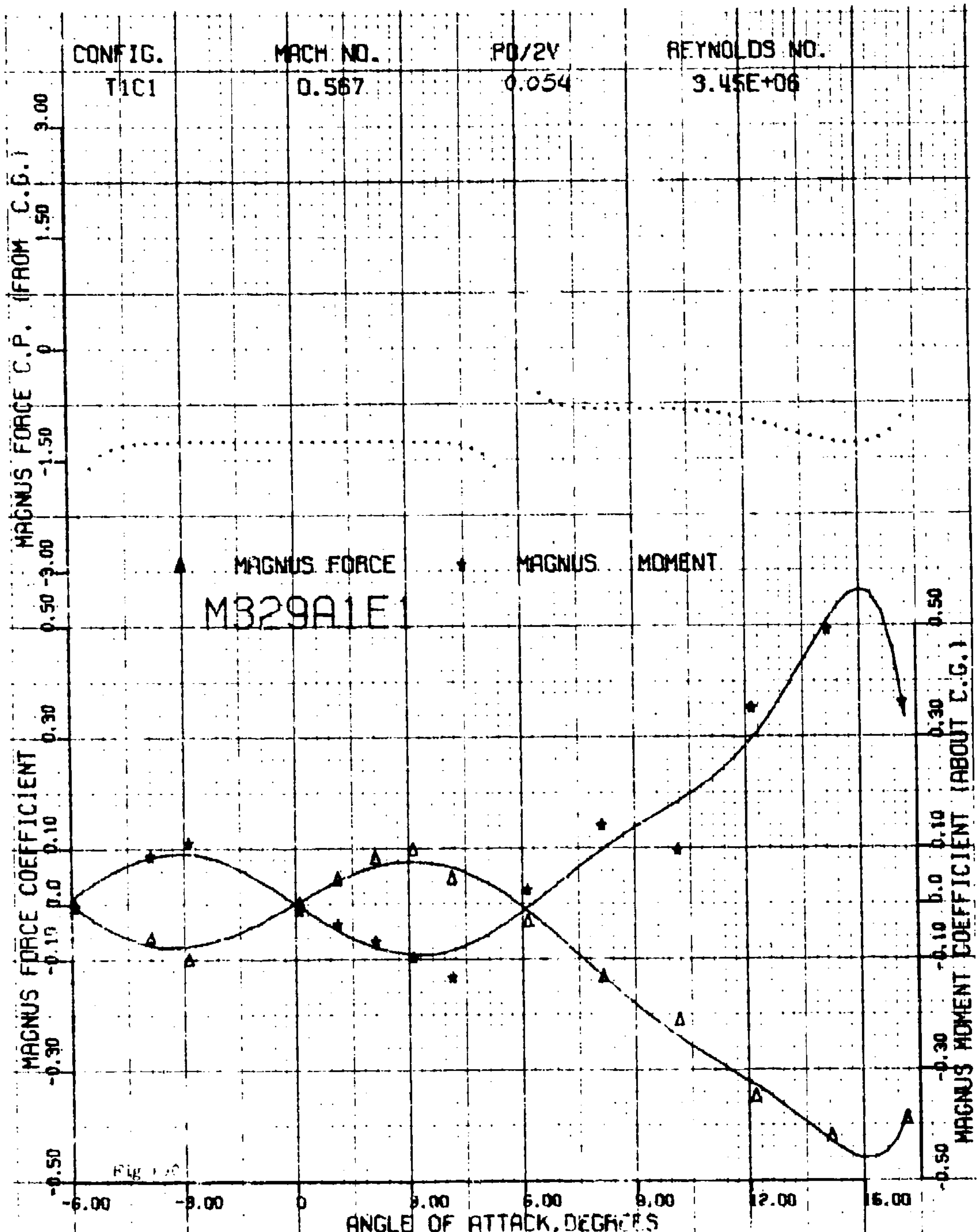
CONFIG.
T1C1
MACH NO.
.550
PD/2V
.337
REYNOLDS NO.
3.00E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 188

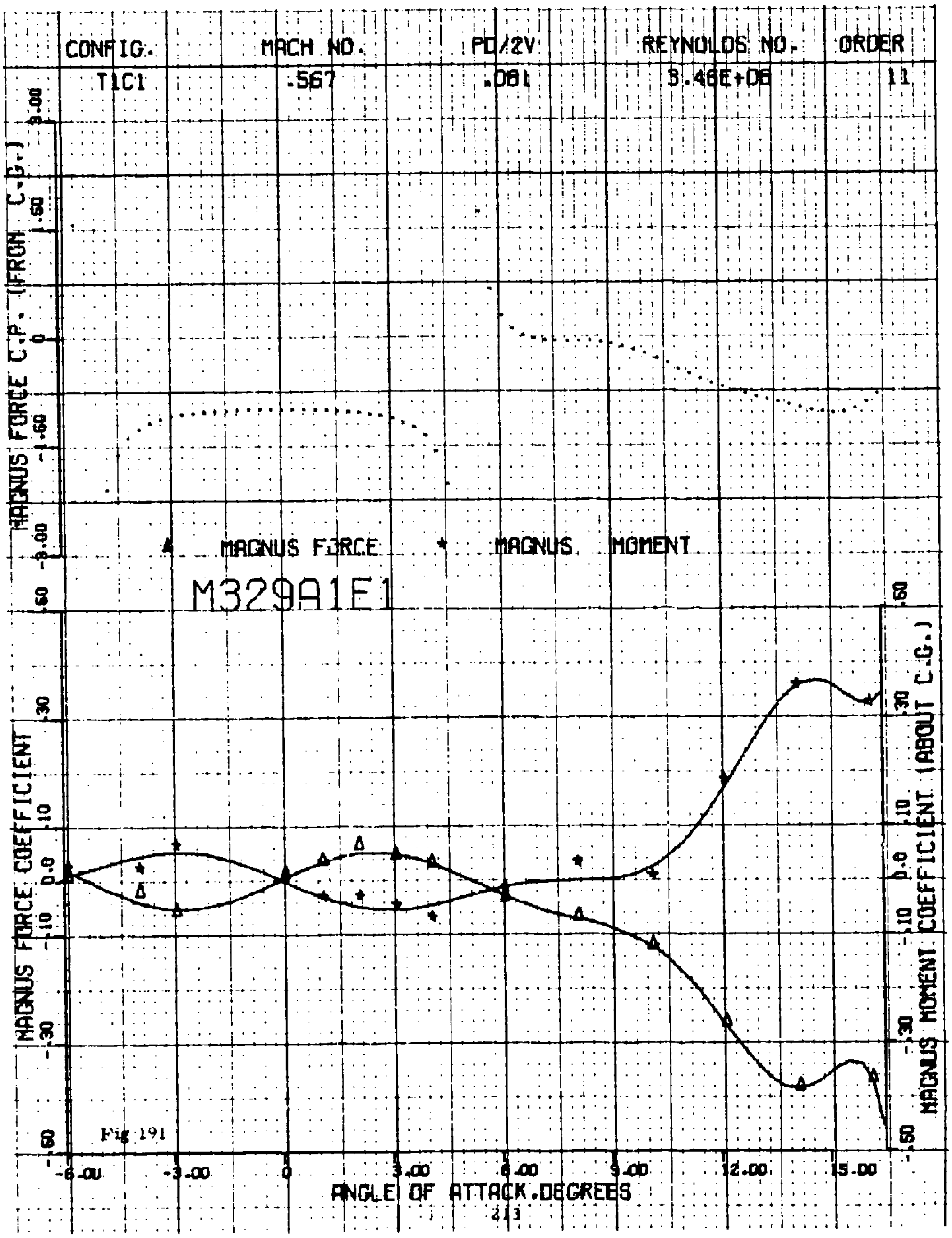


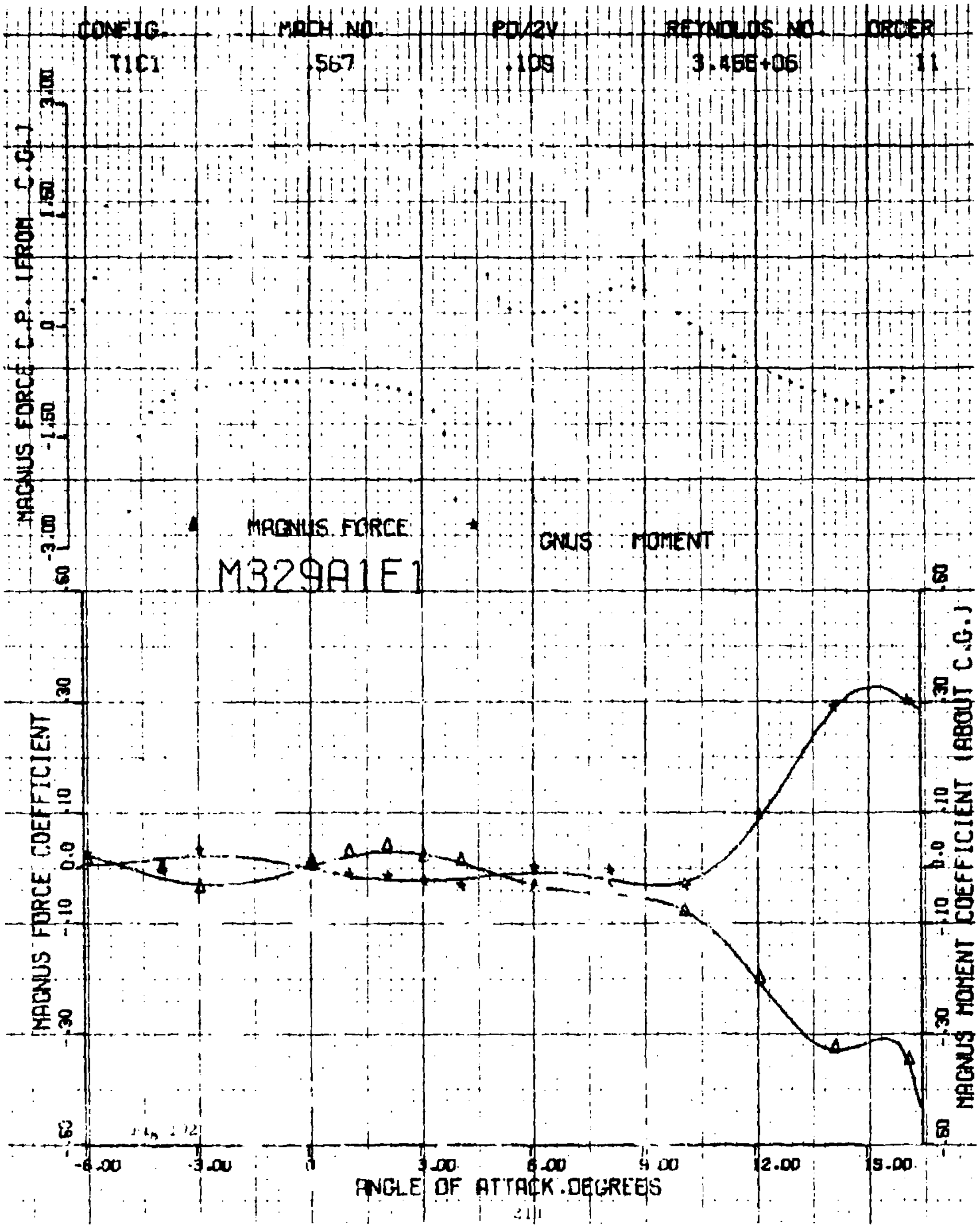
CONFIG. T1C1
MACH NO. 0.567
PD/2V 0.027
REYNOLDS NO. 3.45E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 189

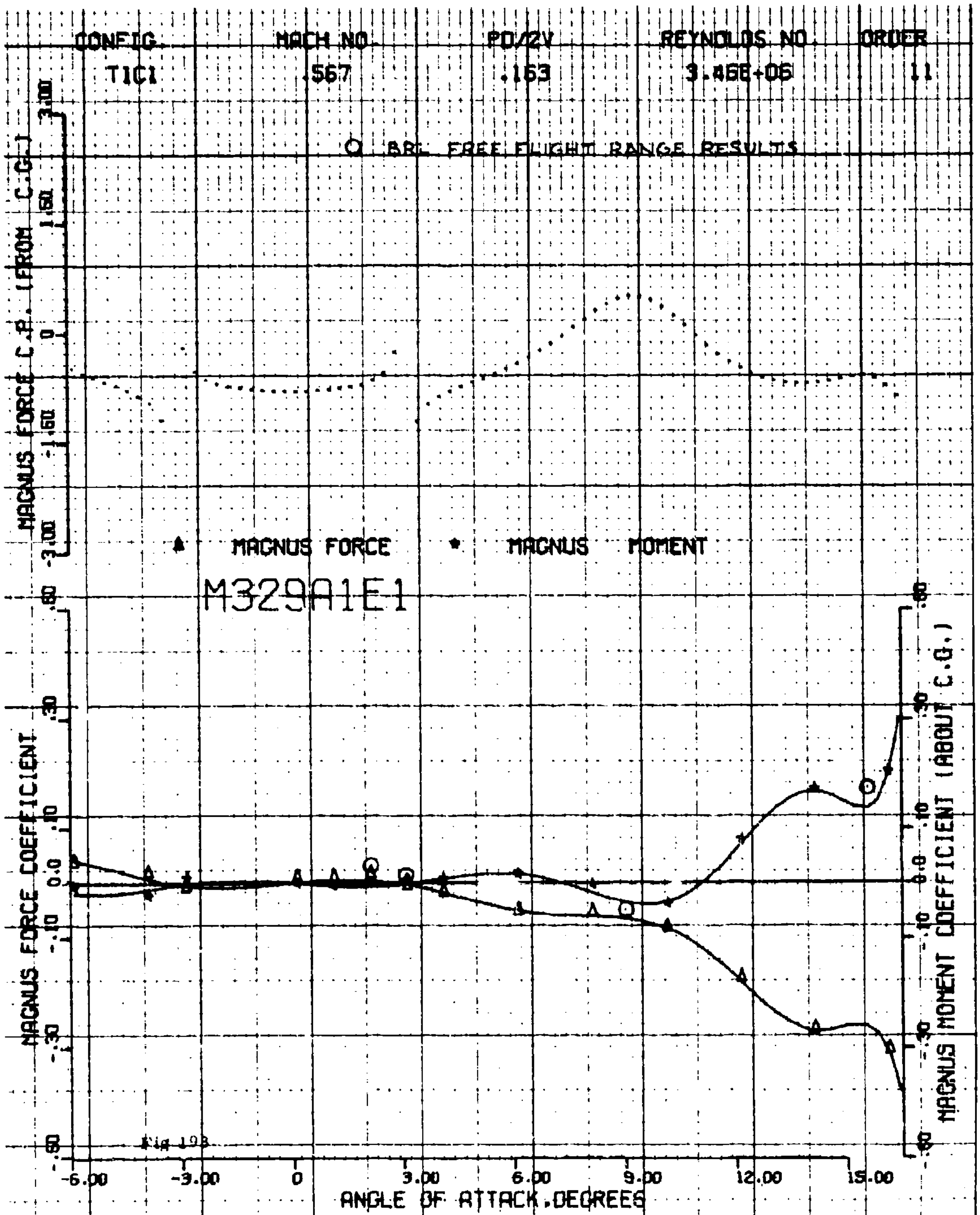


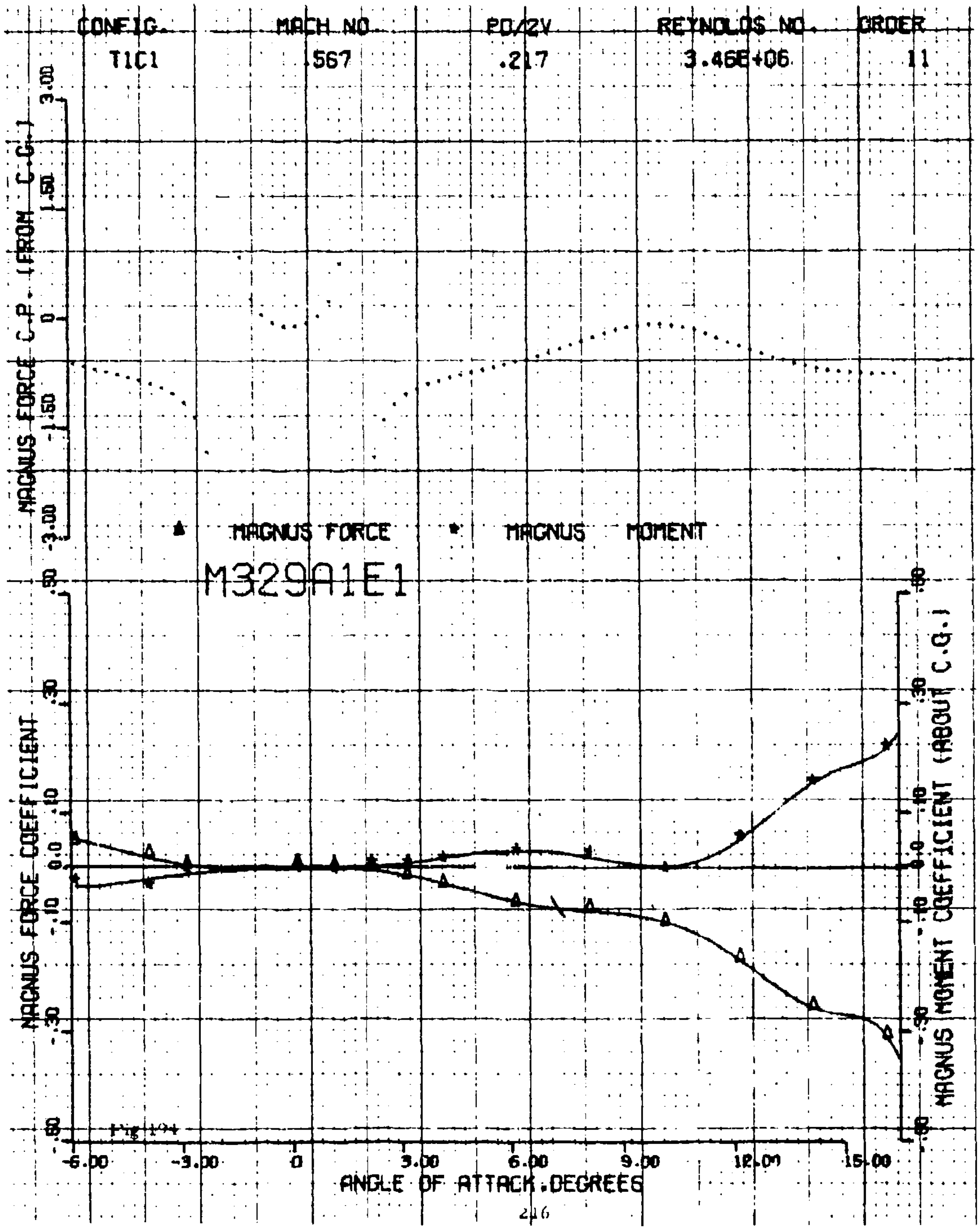
CONFIG.
T1C1
MACH NO.
0.567
PD/2V
0.054
REYNOLDS NO.
3.45E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES


CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 .567 .081 3.46E+06 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK.DEGREES
Fig 191



CONFIG. T1C1
MACH NO .567
PD/2V .109
REYNOLDS NO. 3.45E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
GNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES


CONFIG. T1C1
MACH NO. .567
PD/2V .163
REYNOLDS NO. 3.46E+06
ORDER 11
O BRL FREE FLIGHT RANGE RESULTS
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 193



CONFIG.
T1C1
MACH NO.
.567
PD/2V
.217
REYNOLDS NO.
3.46E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES
Fig 194

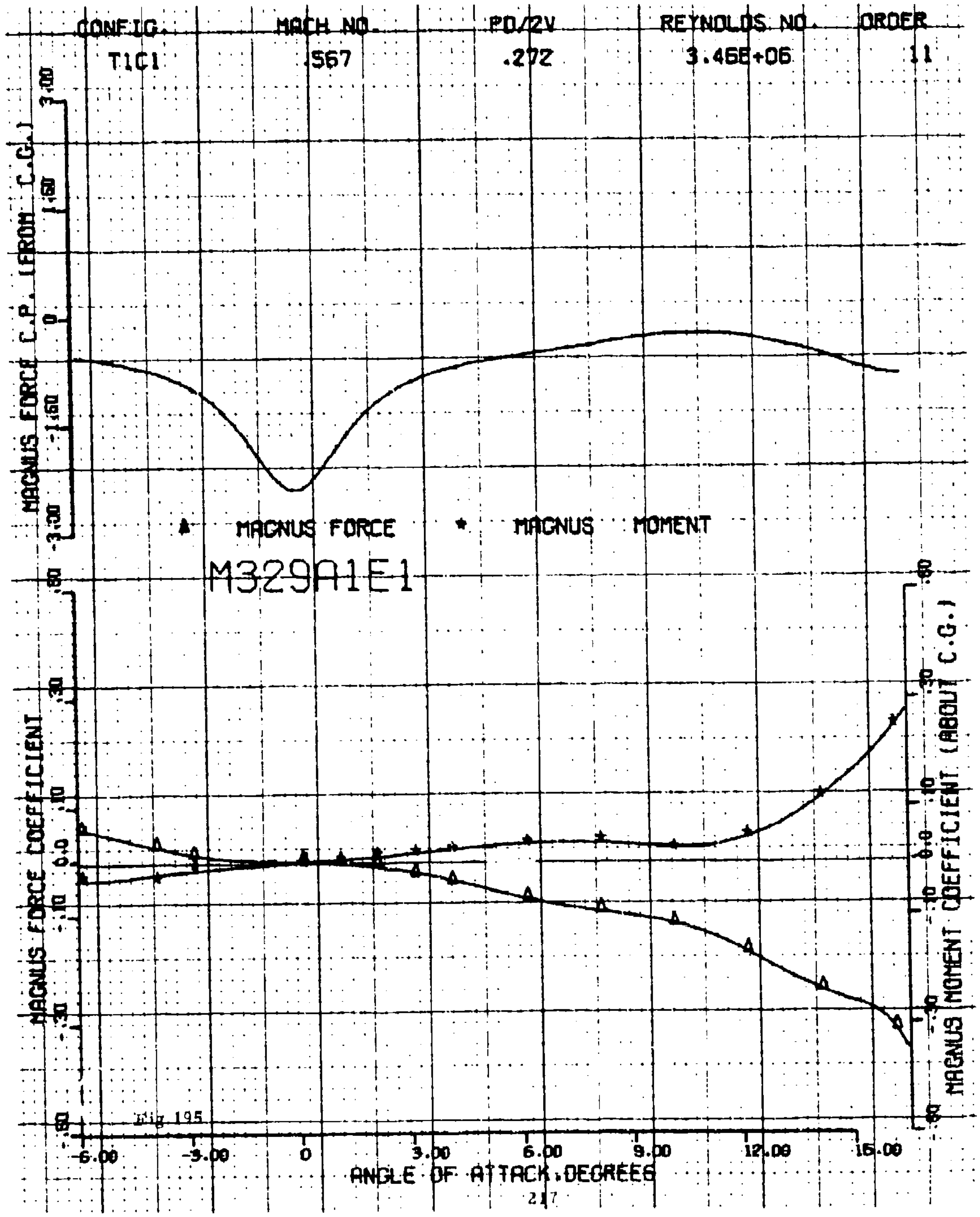
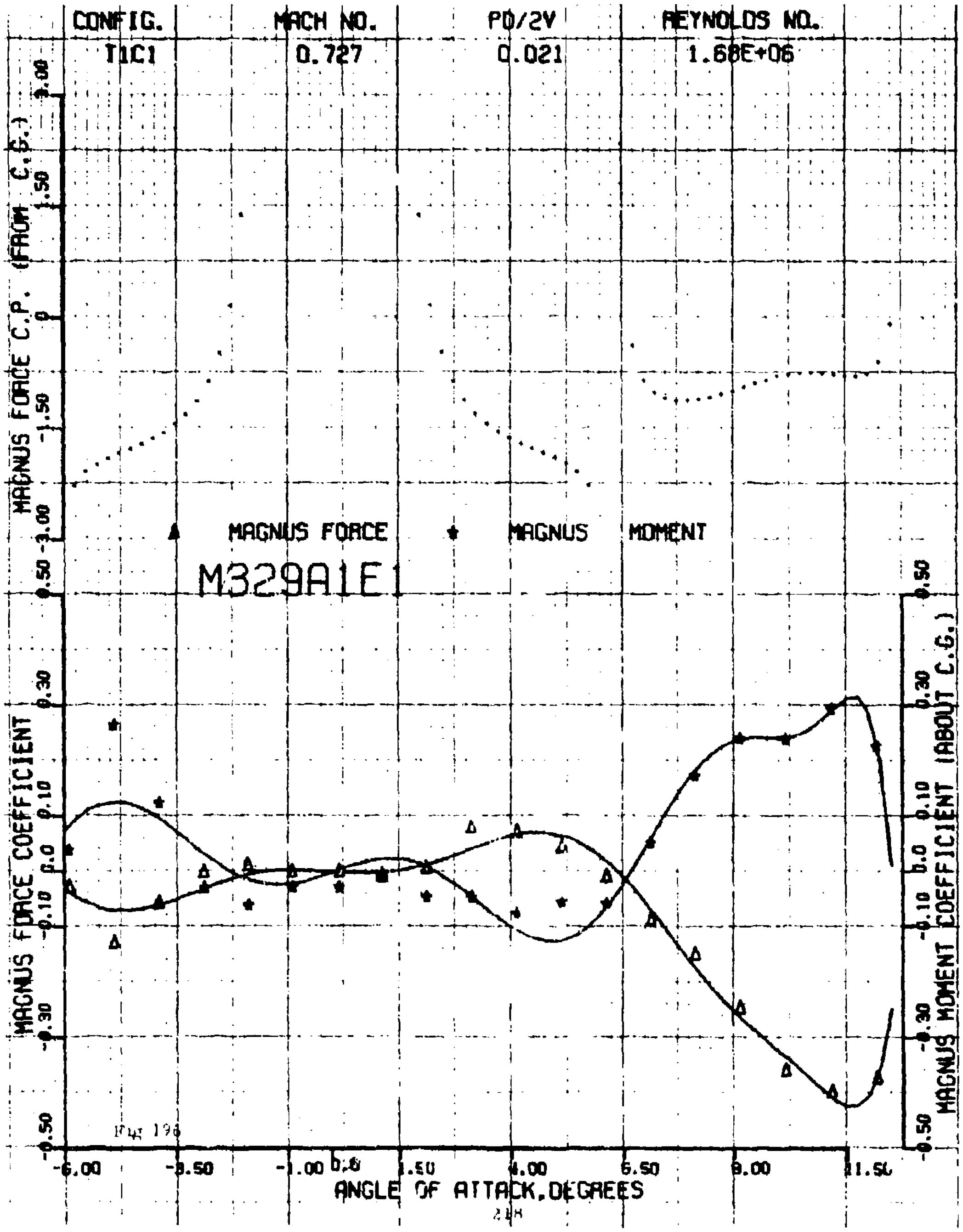
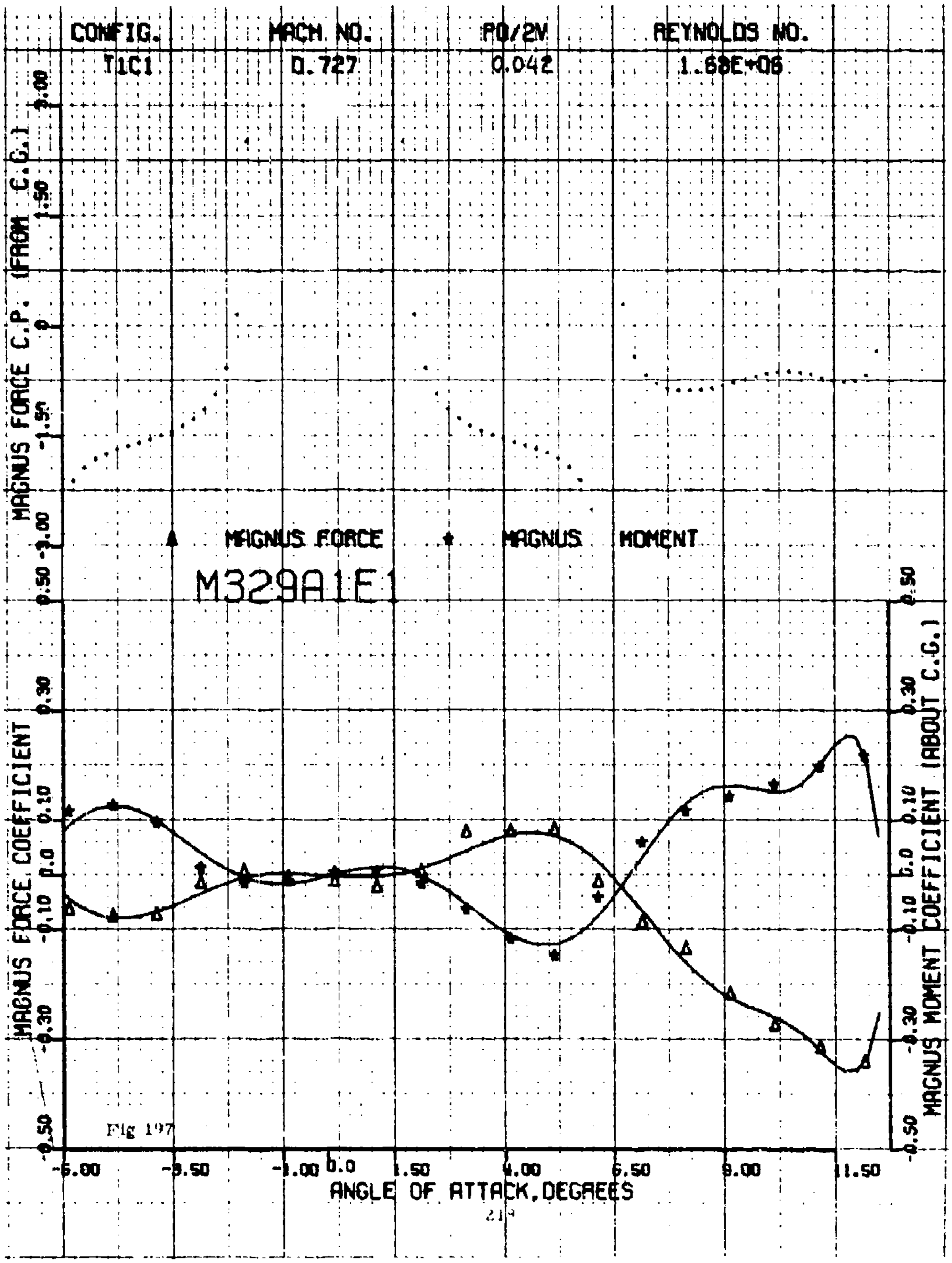

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C1
.567
.272
3.46E+06
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES

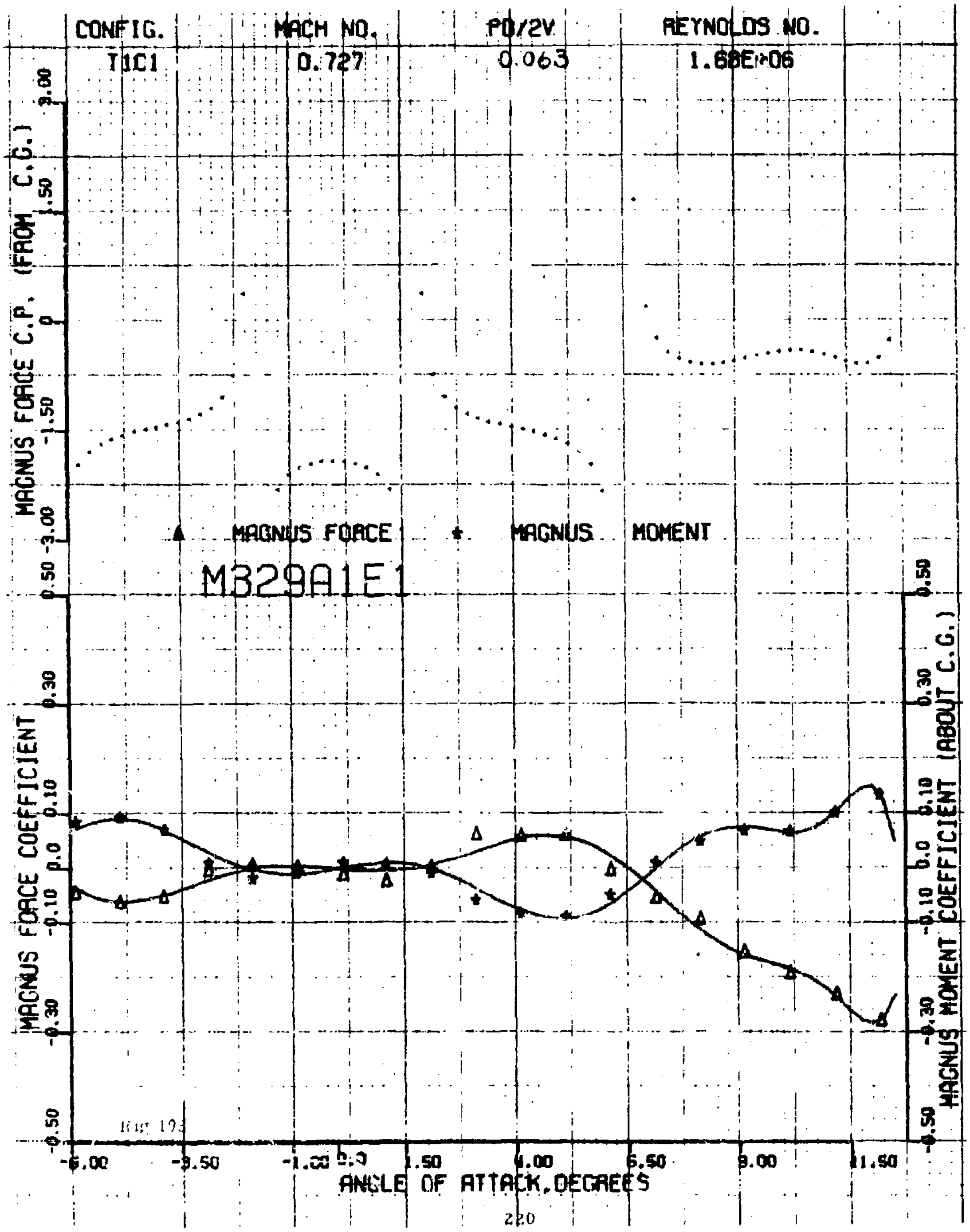
Fig 195



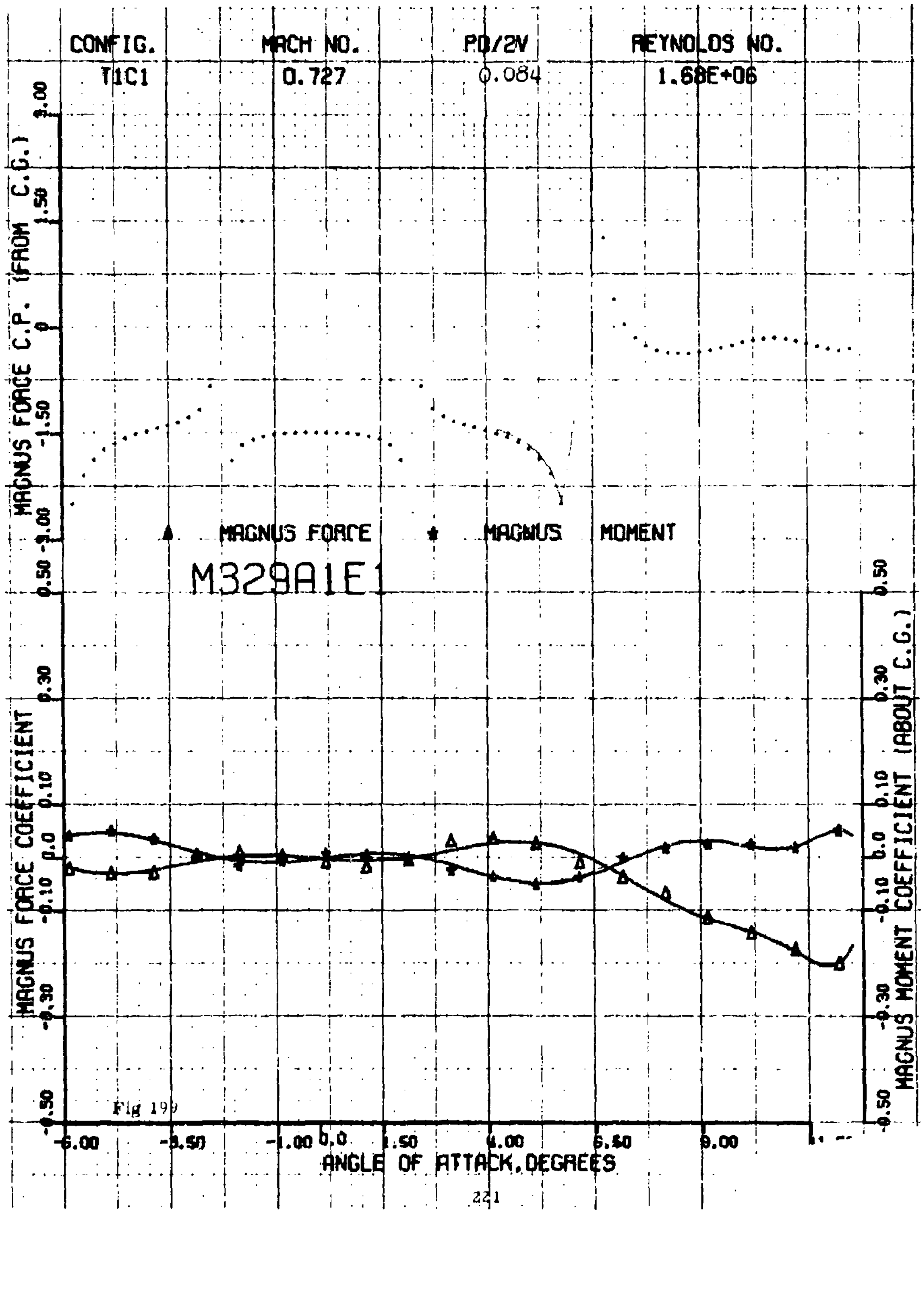
CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.021
REYNOLDS NO.
1.68E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.50
-1.00
1.50
4.00
6.50
9.00
11.50

Fig 196

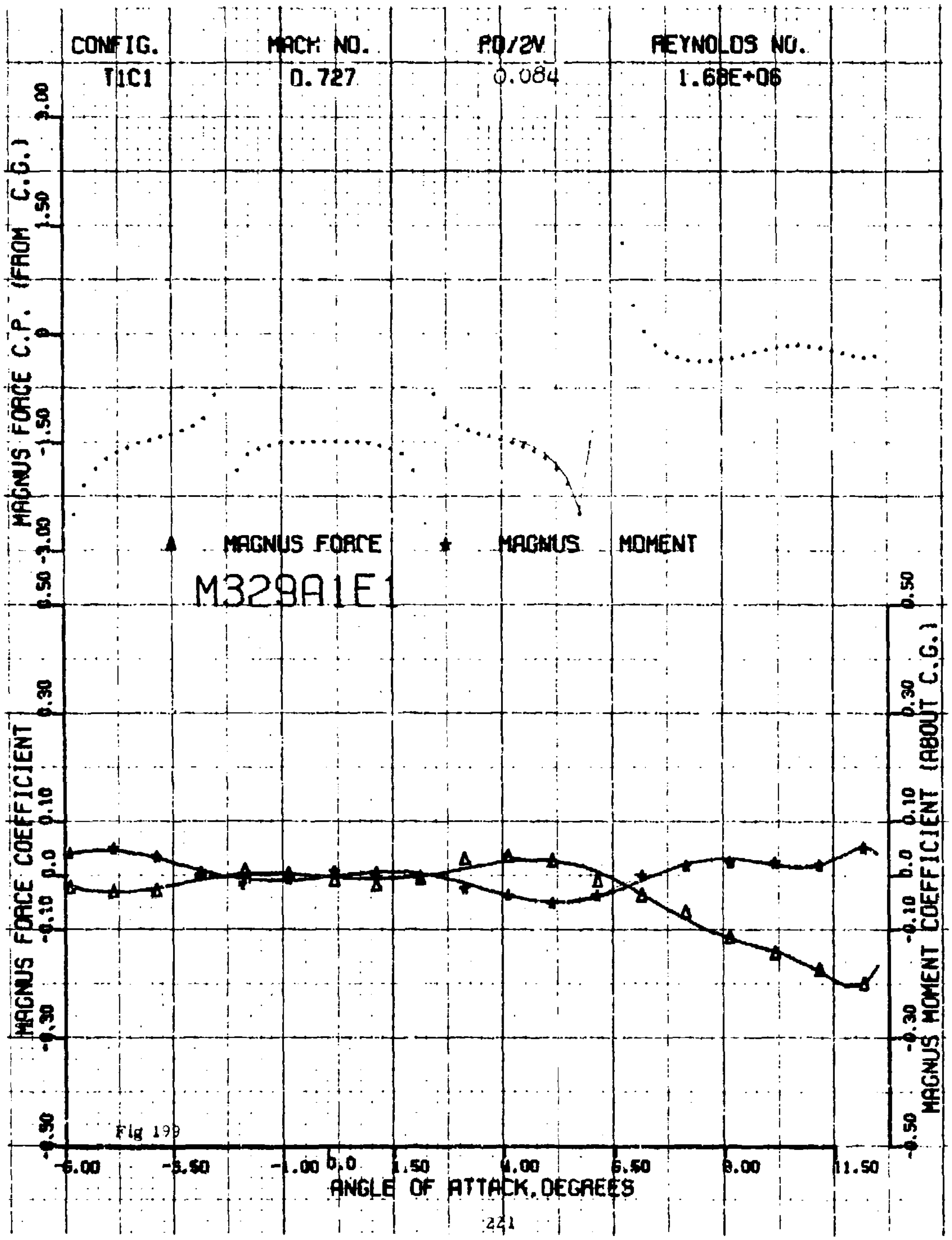

CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.042
REYNOLDS NO.
1.68E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
Fig 197



CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.063
REYNOLDS NO.
1.68E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES



CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.084
REYNOLDS NO.
1.68E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 199


CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.084
REYNOLDS NO.
1.68E+06
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 199

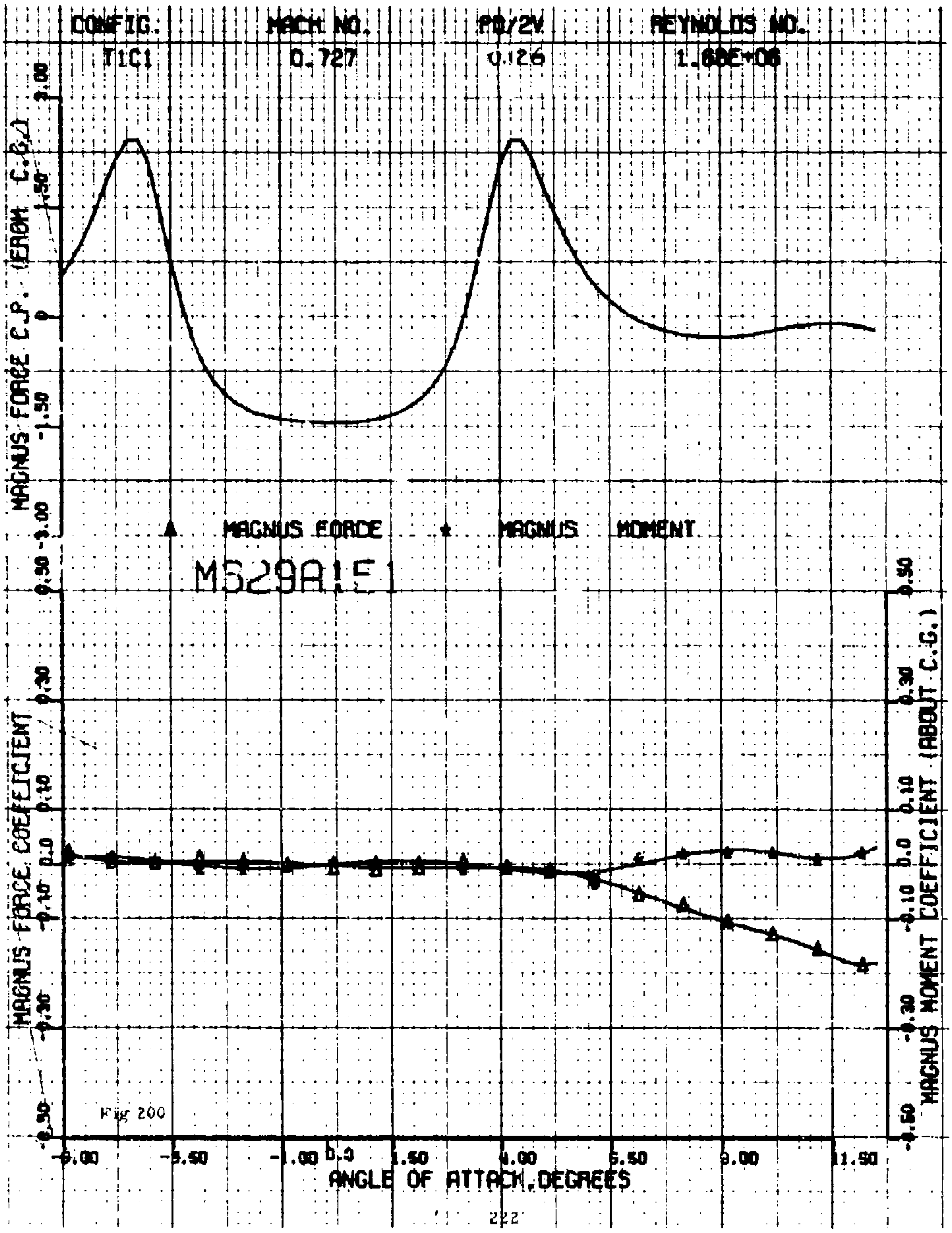
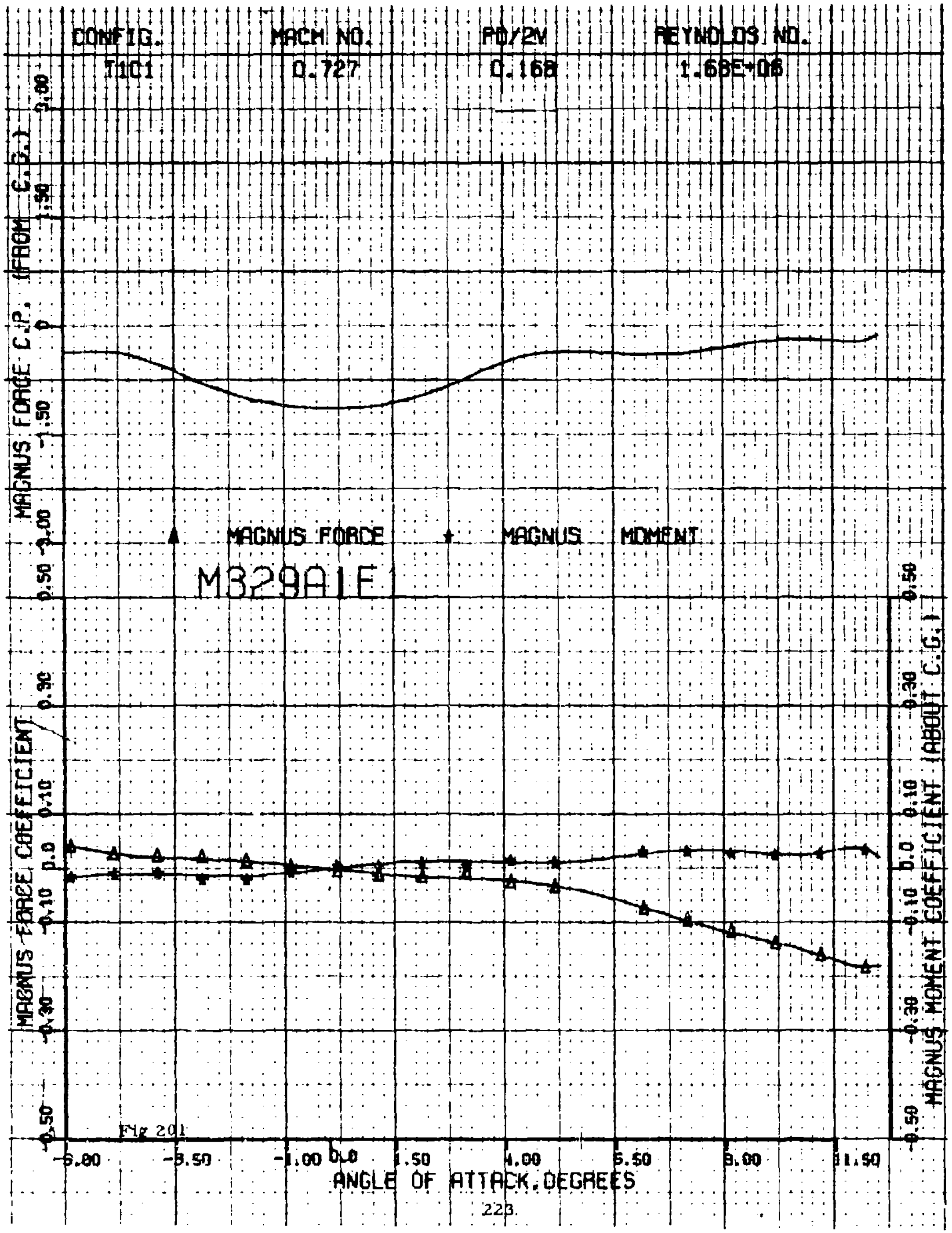
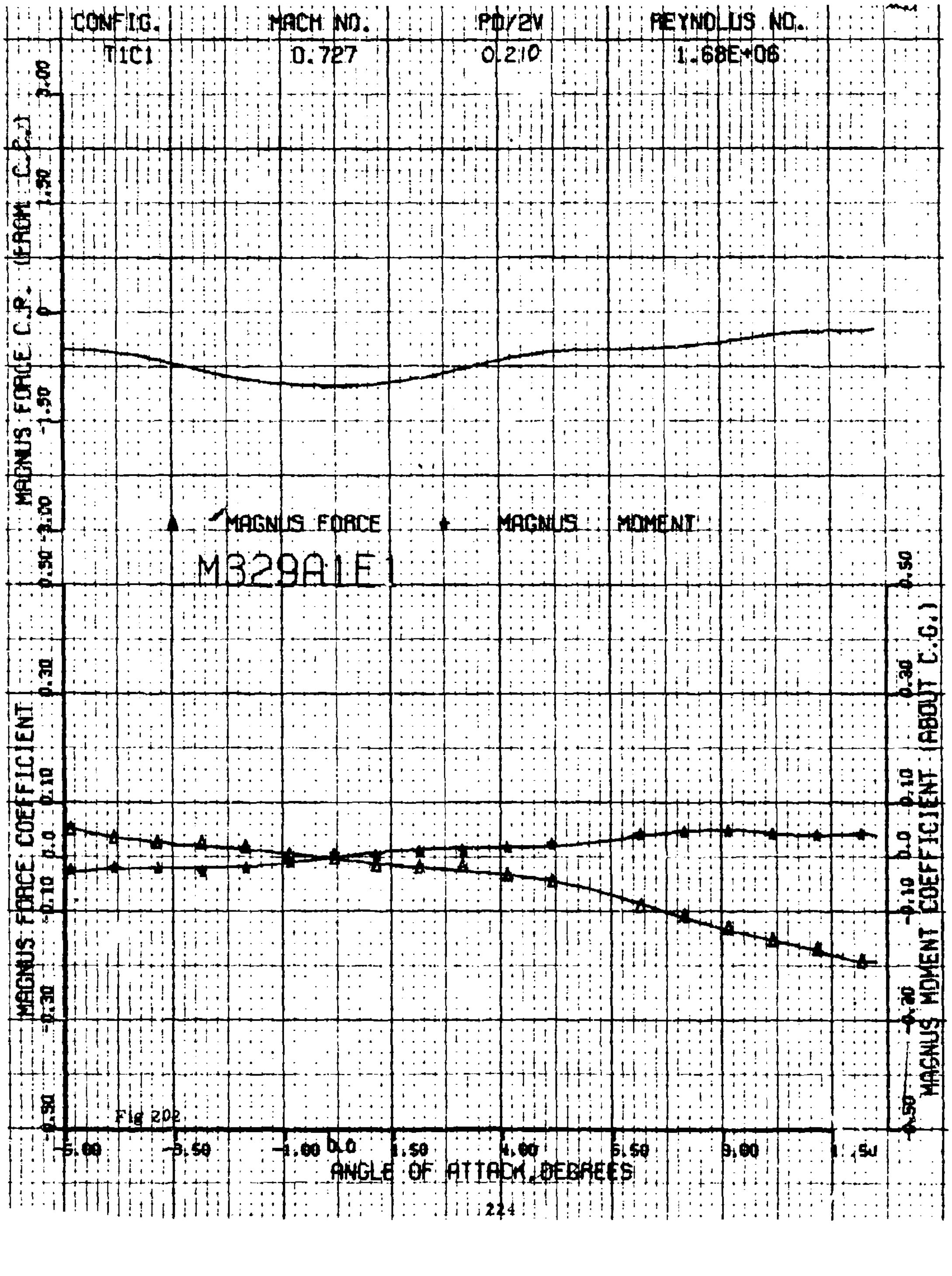

CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.126
REYNOLDS NO.
1.88E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
MS29A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

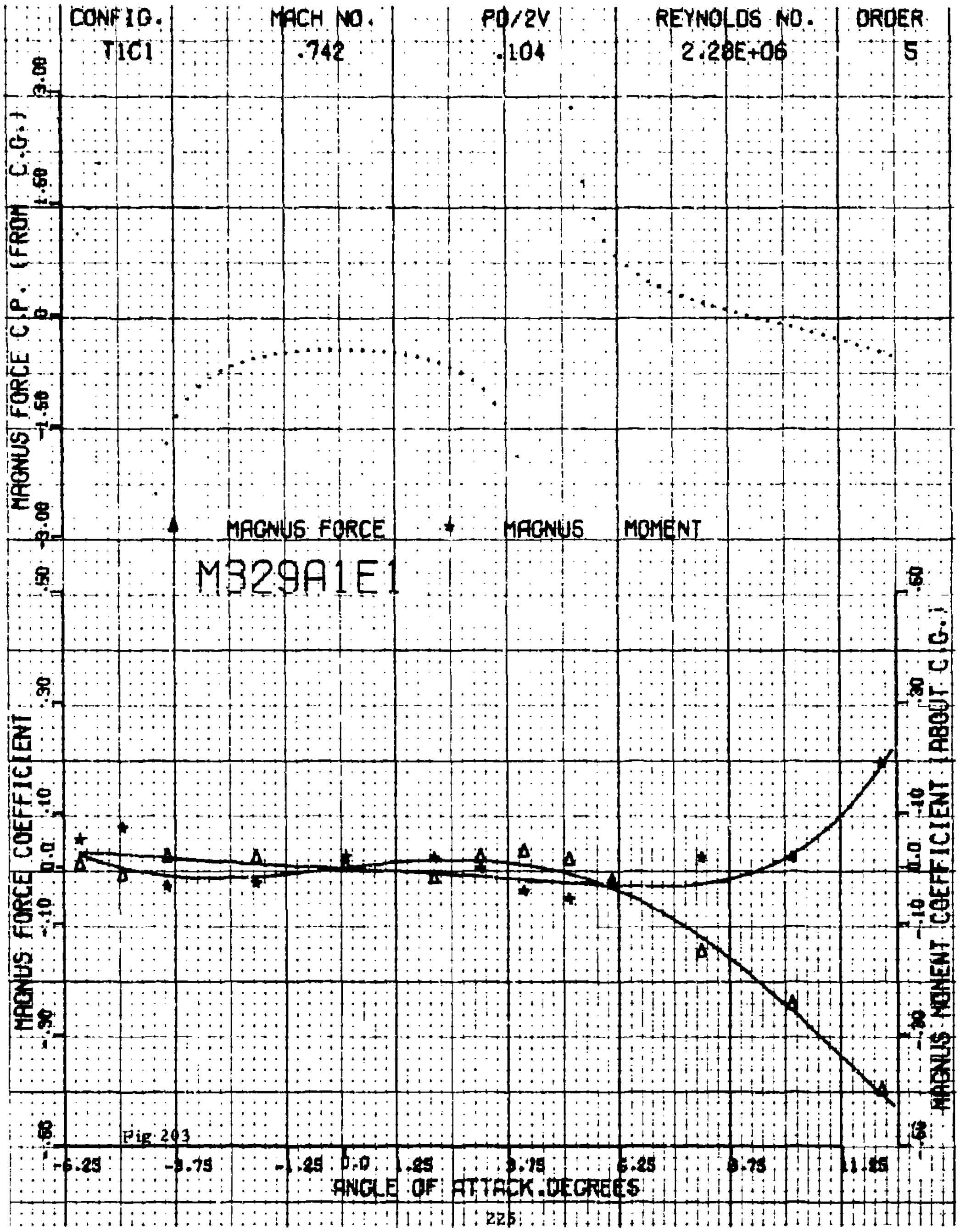
Fig 200



CONFIG. T1C1
MACH NO. 0.727
PD/2V 0.168
REYNOLDS NO. 1.68E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

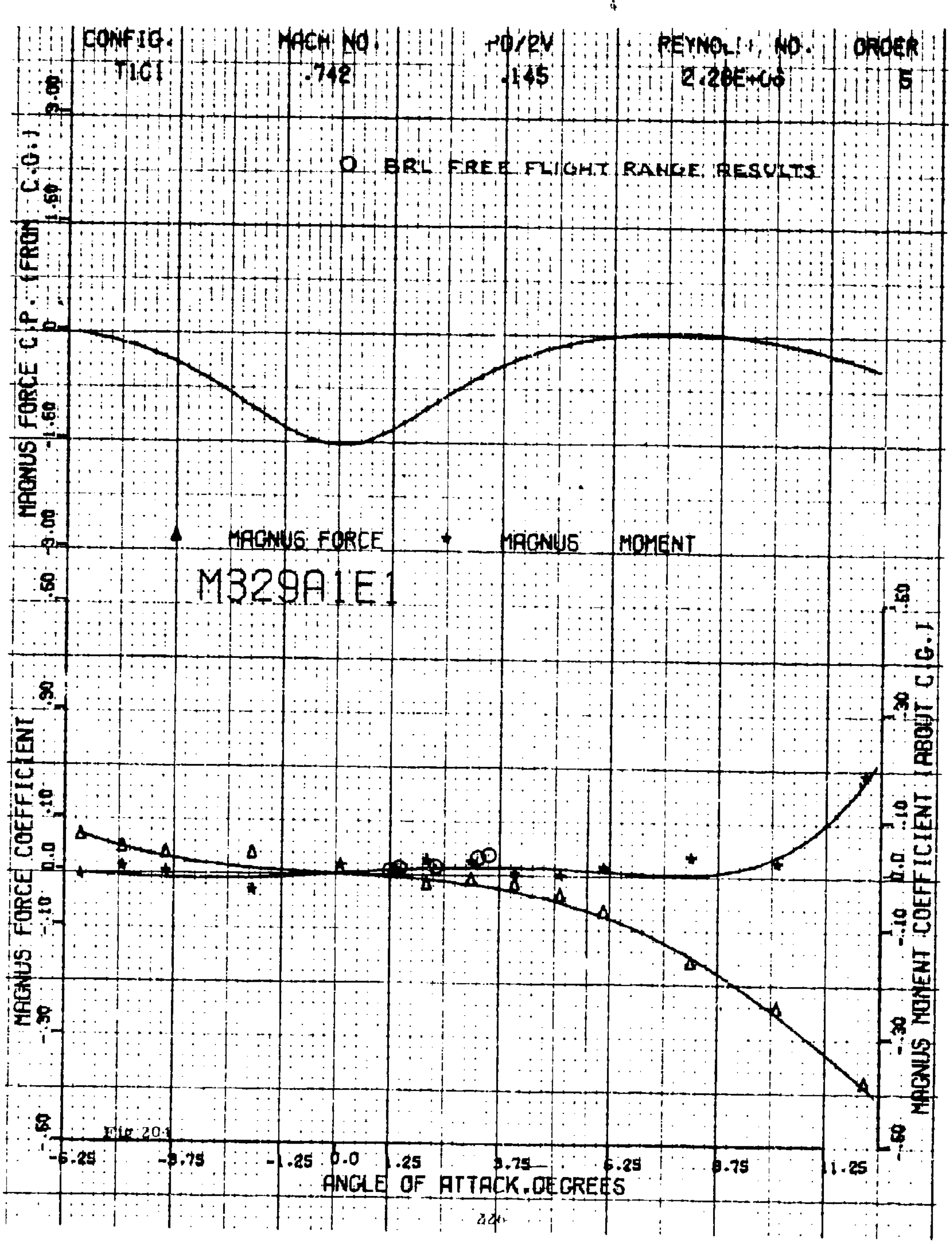
Fig 201


CONFIG.
T1C1
MACH NO.
0.727
PD/2V
0.210
REYNOLDS NO.
1.68E+06
MAGNUS FORCE C.P. (FROM C.P.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 202
ANGLE OF ATTACK,DEGREES

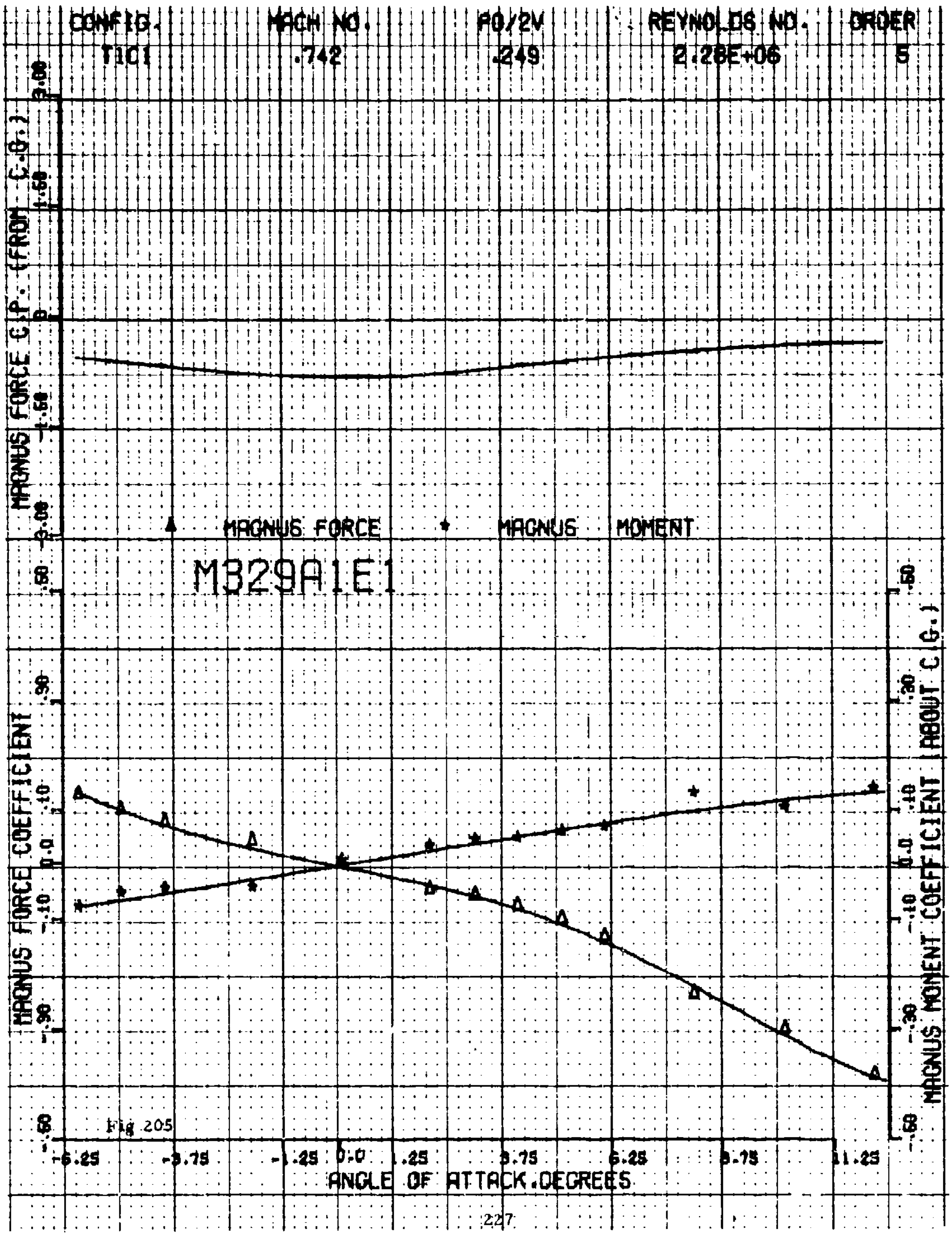


CONFIG. T1C1
MACH NO. .742
PD/2V .104
REYNOLDS NO. 2.28E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 203

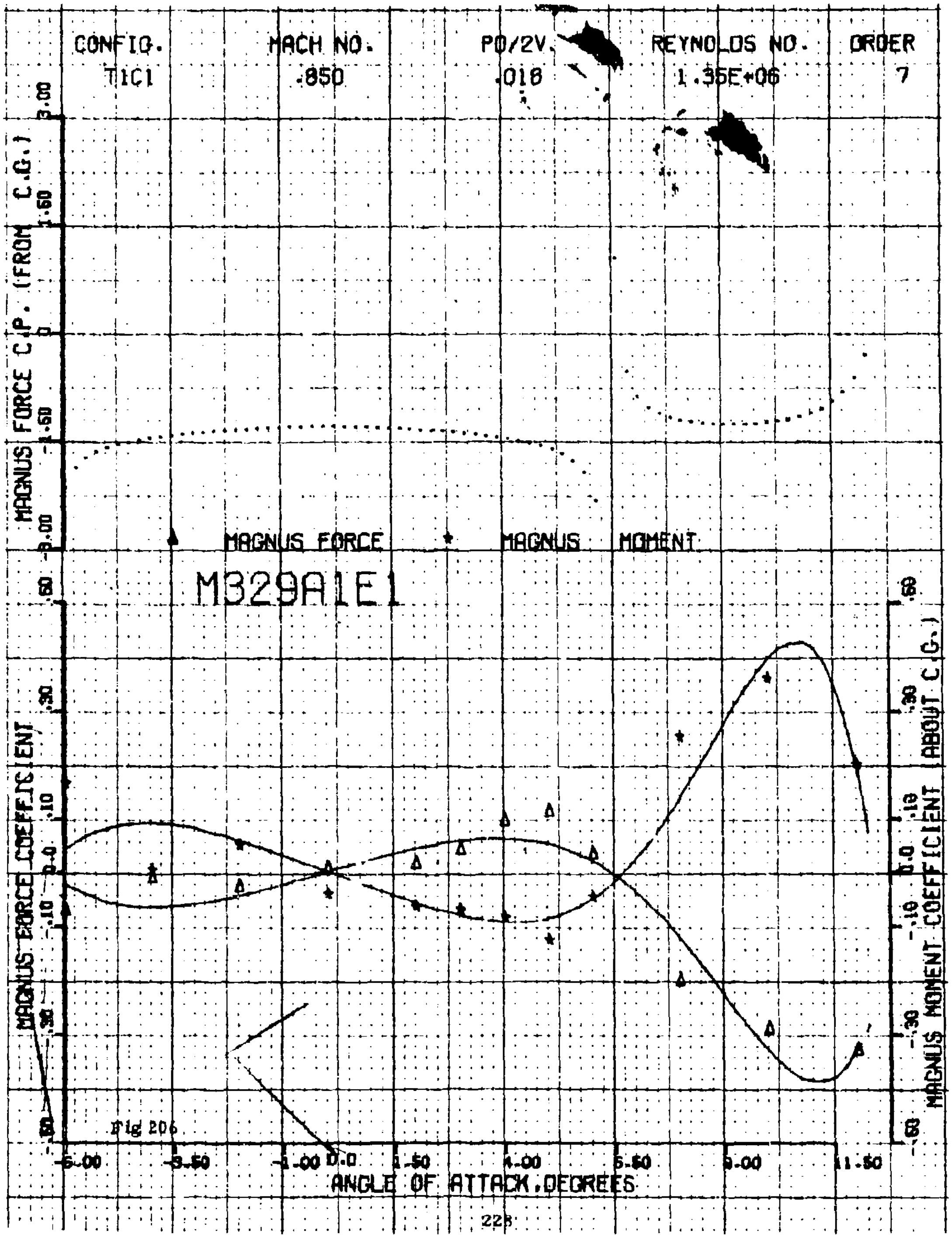


CONFIG. T1C1
MACH NO. .742
PD/2V .145
REYNOLDS NO. 2.28E+06
ORDER 5
O BRL FREE FLIGHT RANGE RESULTS
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 20.1



CONFIG. T1C1
MACH NO. .742
PD/2V .249
REYNOLDS NO. 2.28E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 205


CONFIG.
TIC1
MACH NO.
.850
PD/2V.
.018
REYNOLDS NO.
1.35E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 206
-5.00
-2.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK, DEGREES

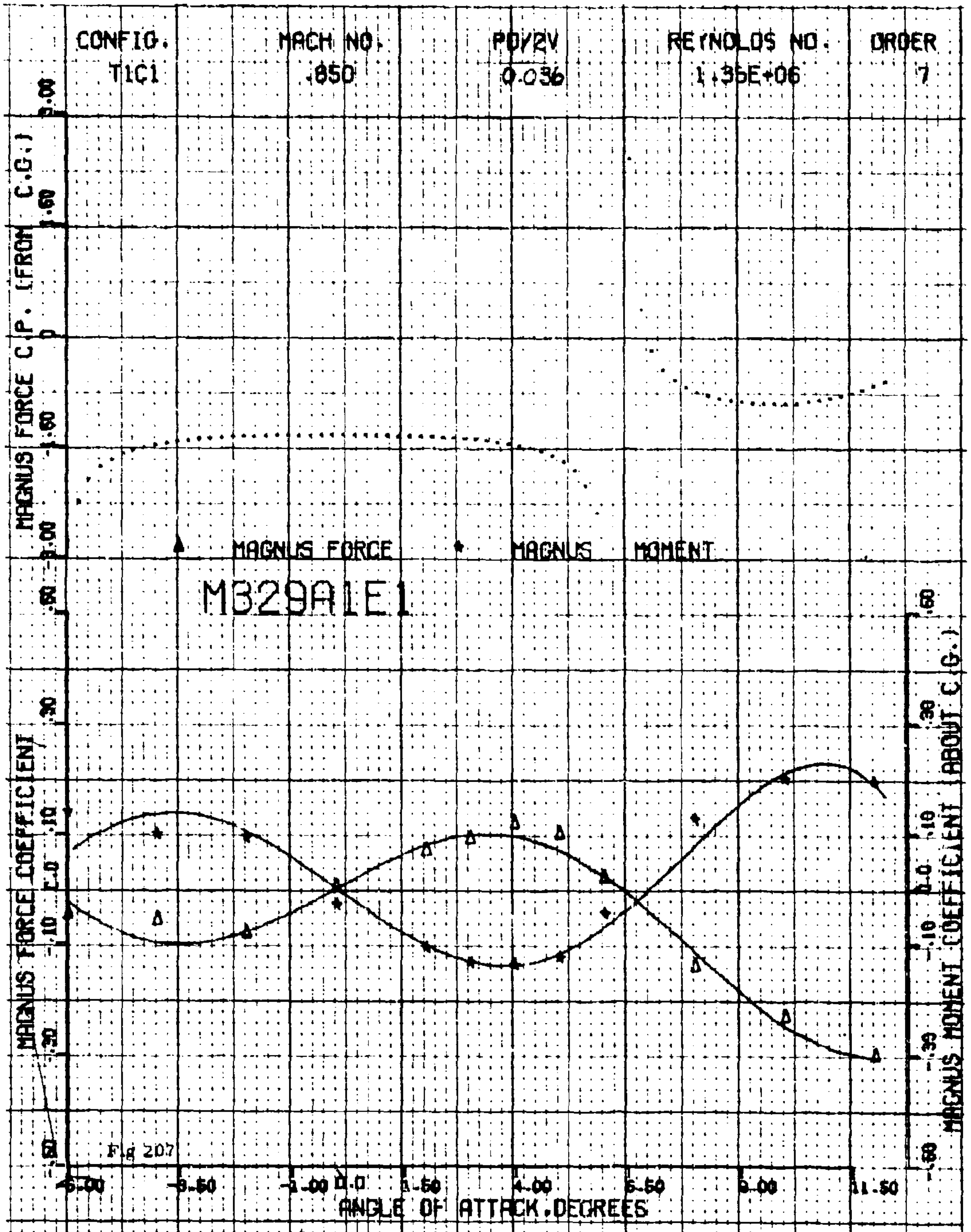
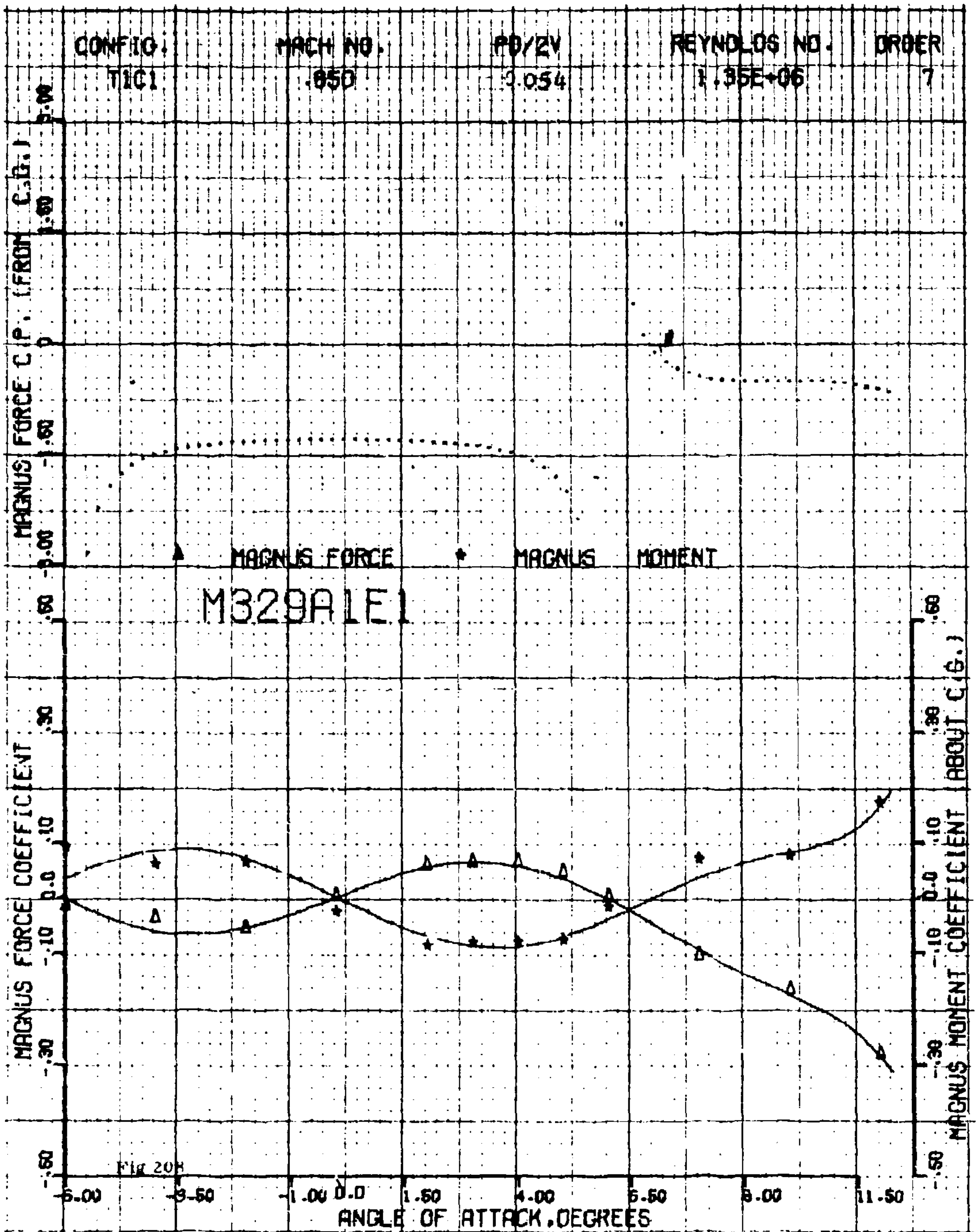

CONFIG.
T1C1
MACH NO.
.850
PD/2V
0.036
REYNOLDS NO.
1.35E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 207


CONFIG.
T1C1
MACH NO.
.850
PD/2V
0.054
REYNOLDS NO.
1.35E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
Fig 208

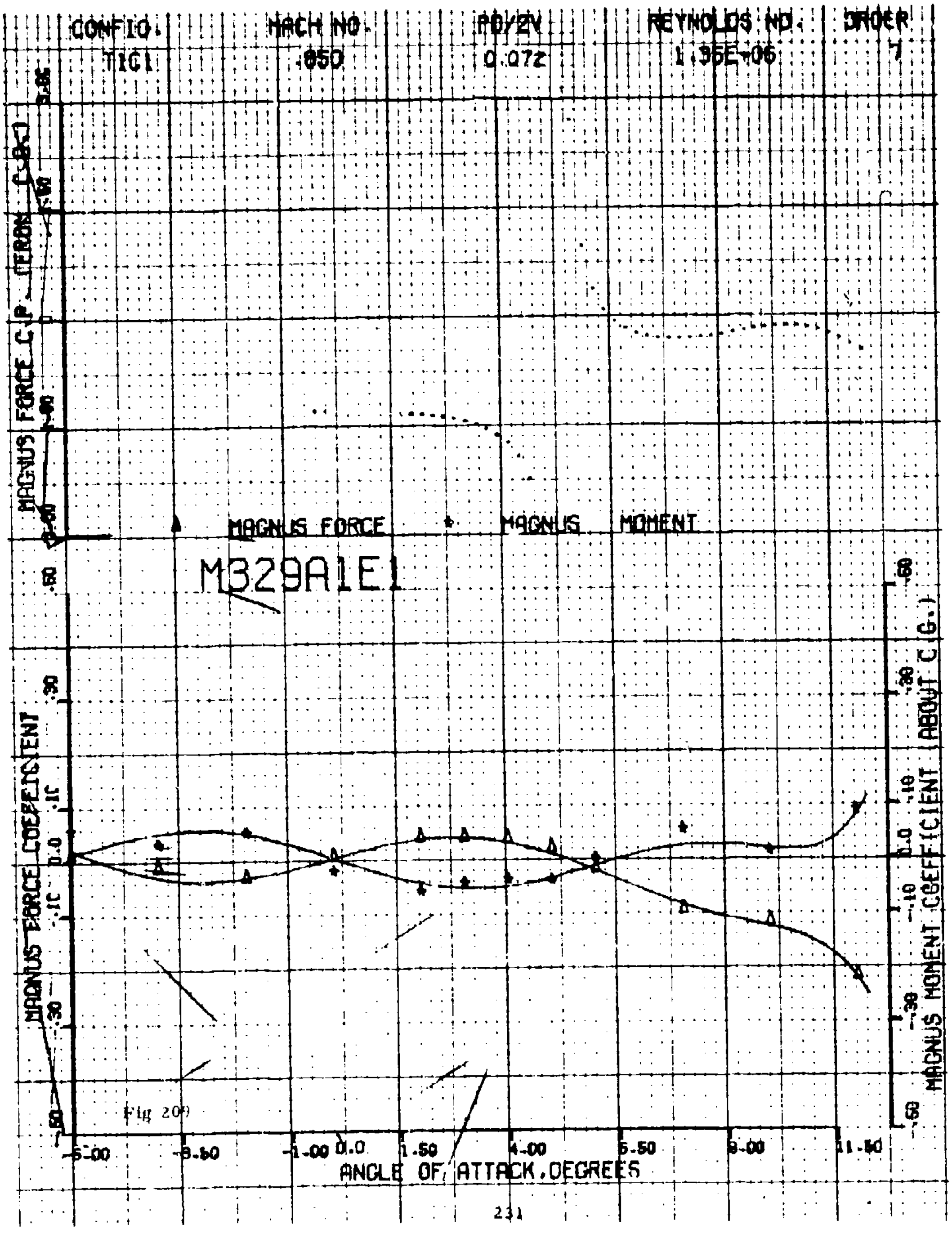
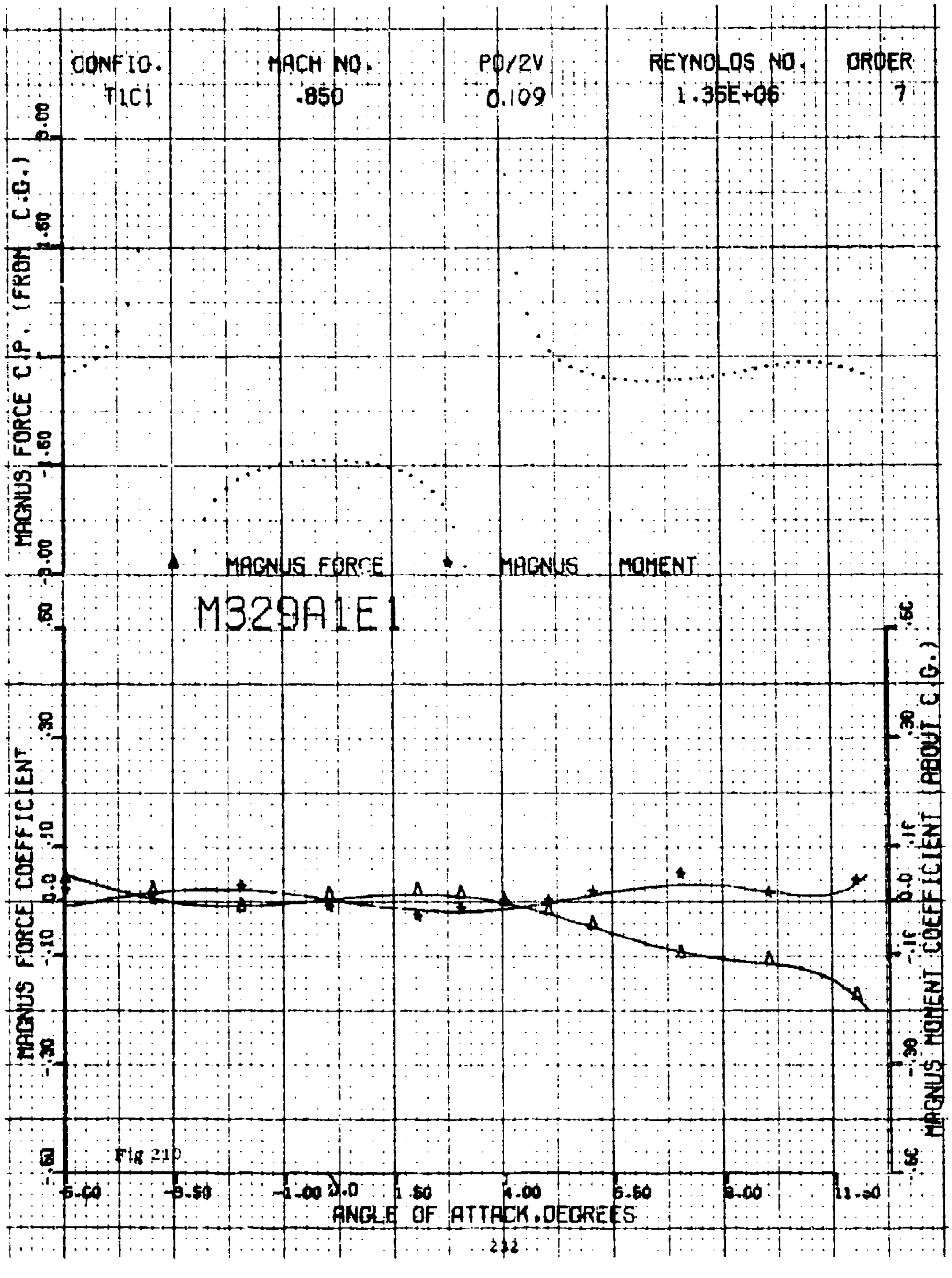
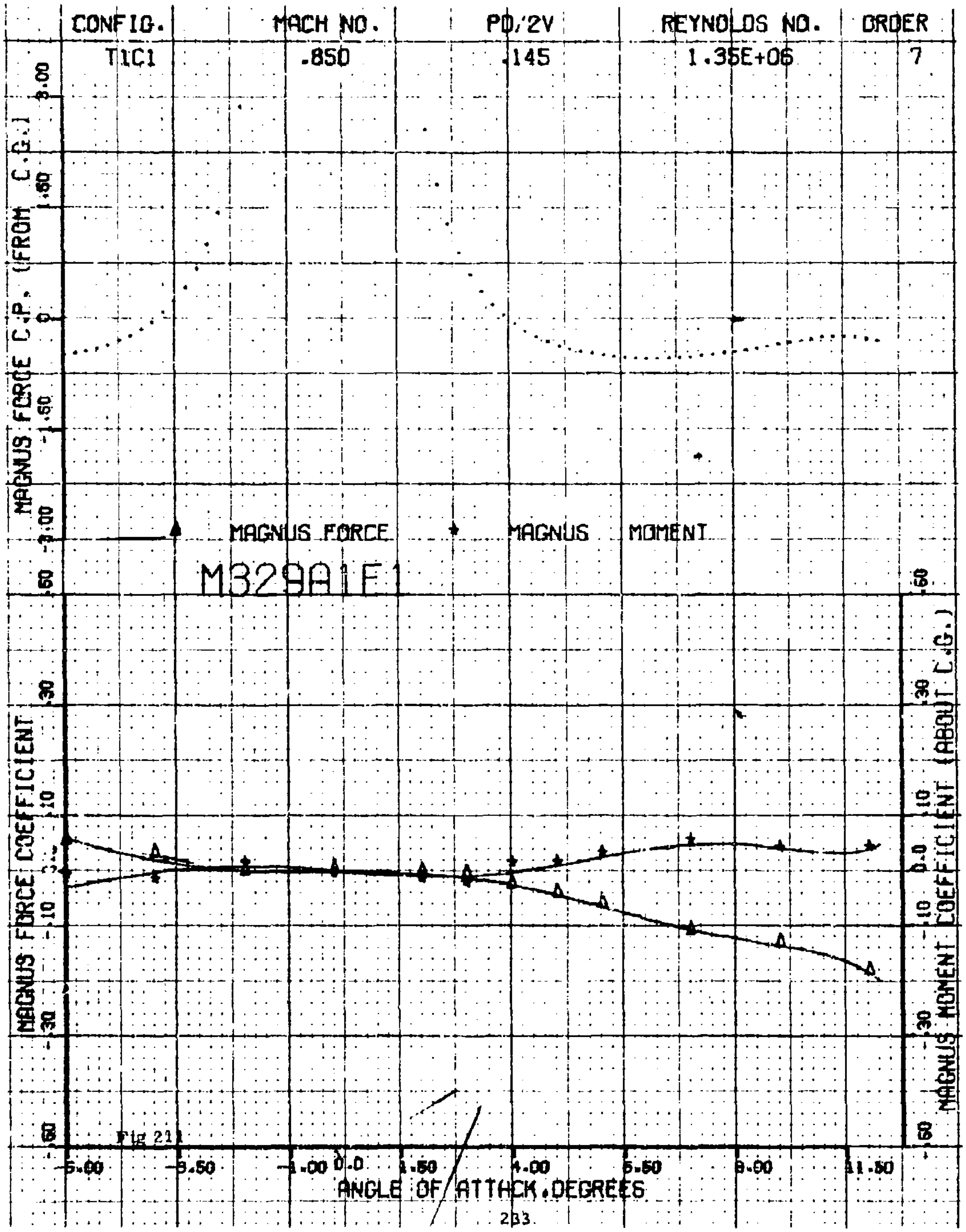

CONFIG. TIC1
MACH NO. .850
PD/2V 0.072
REYNOLDS NO. 1.35E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.B.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 209



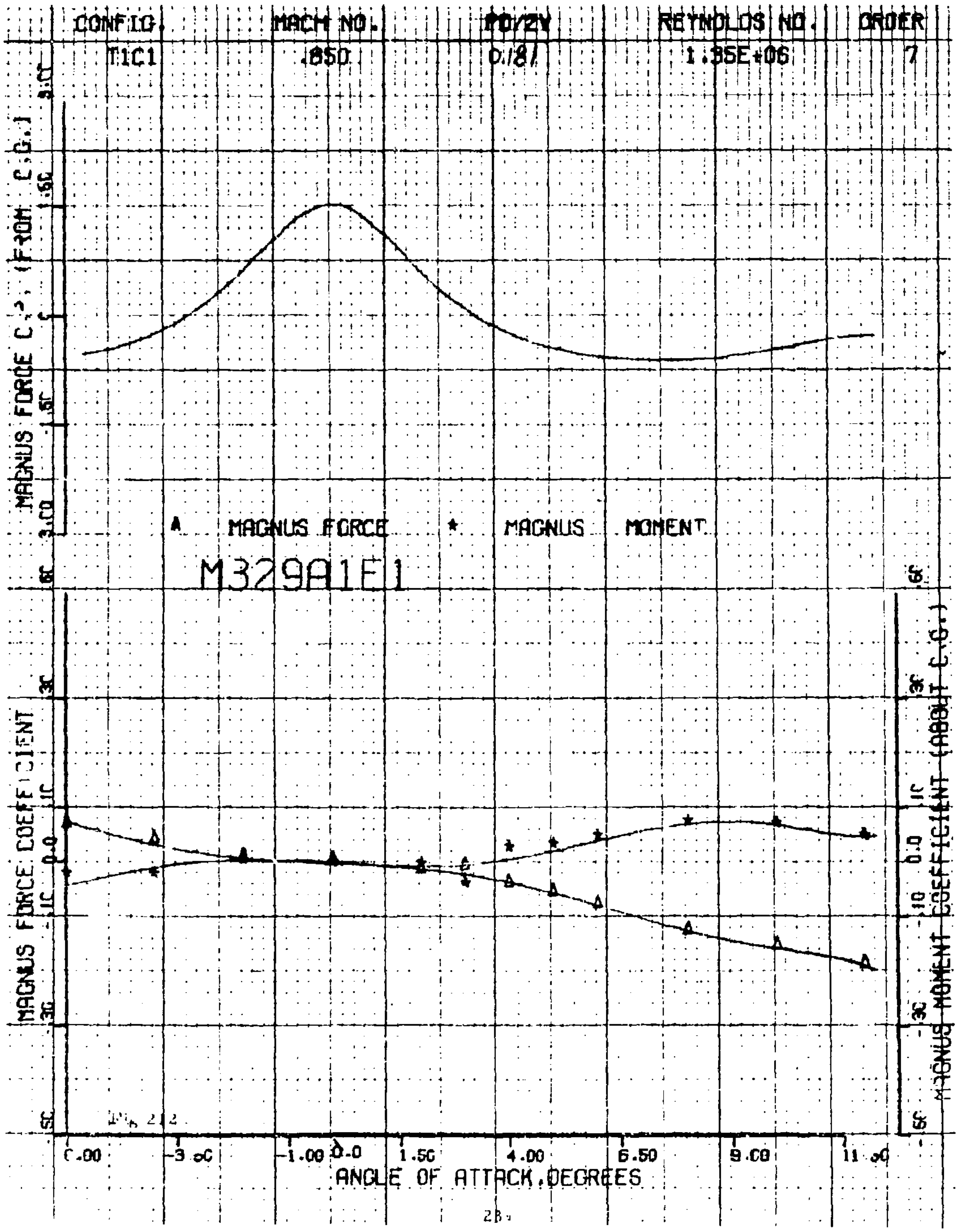
CONFIG.
T1C1
MACH NO.
.850
PD/2V
0.109
REYNOLDS NO.
1.35E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

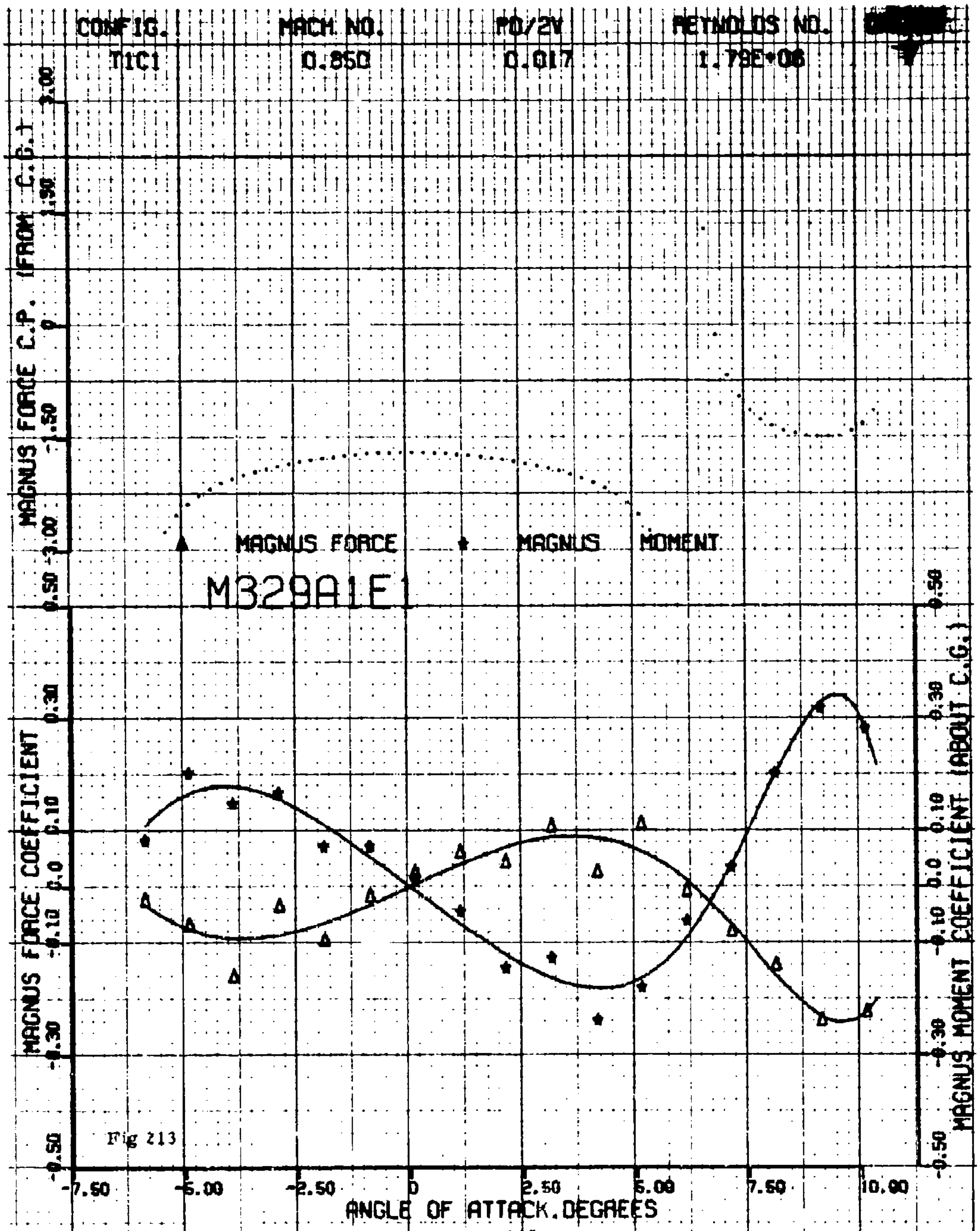
Fig 210



CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 .850 .145 1.35E+06 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

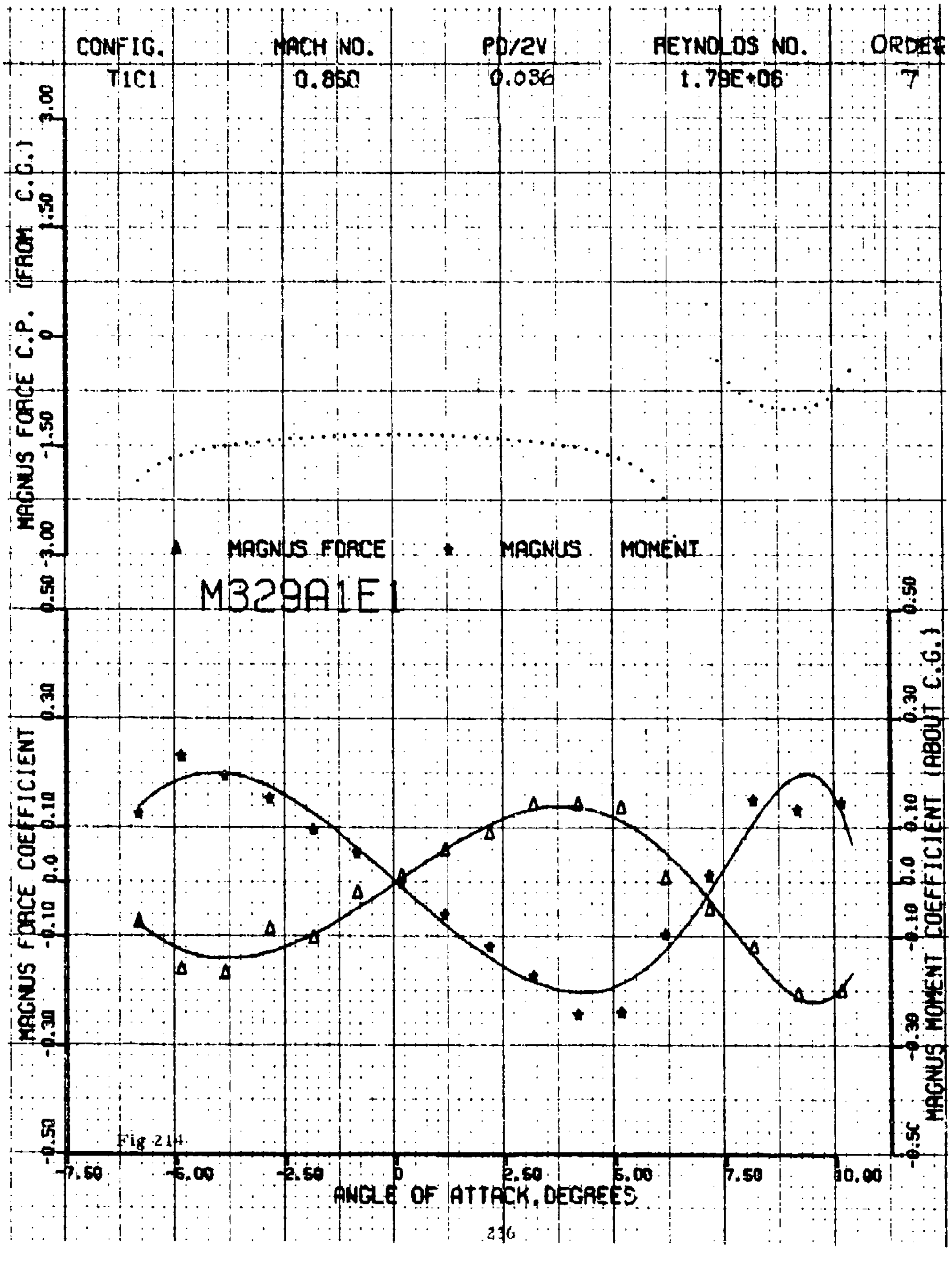
Fig 21


CONFIG
T1C1
MACH NO.
.850
PD/2V
REYNOLDS NO.
1.35E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

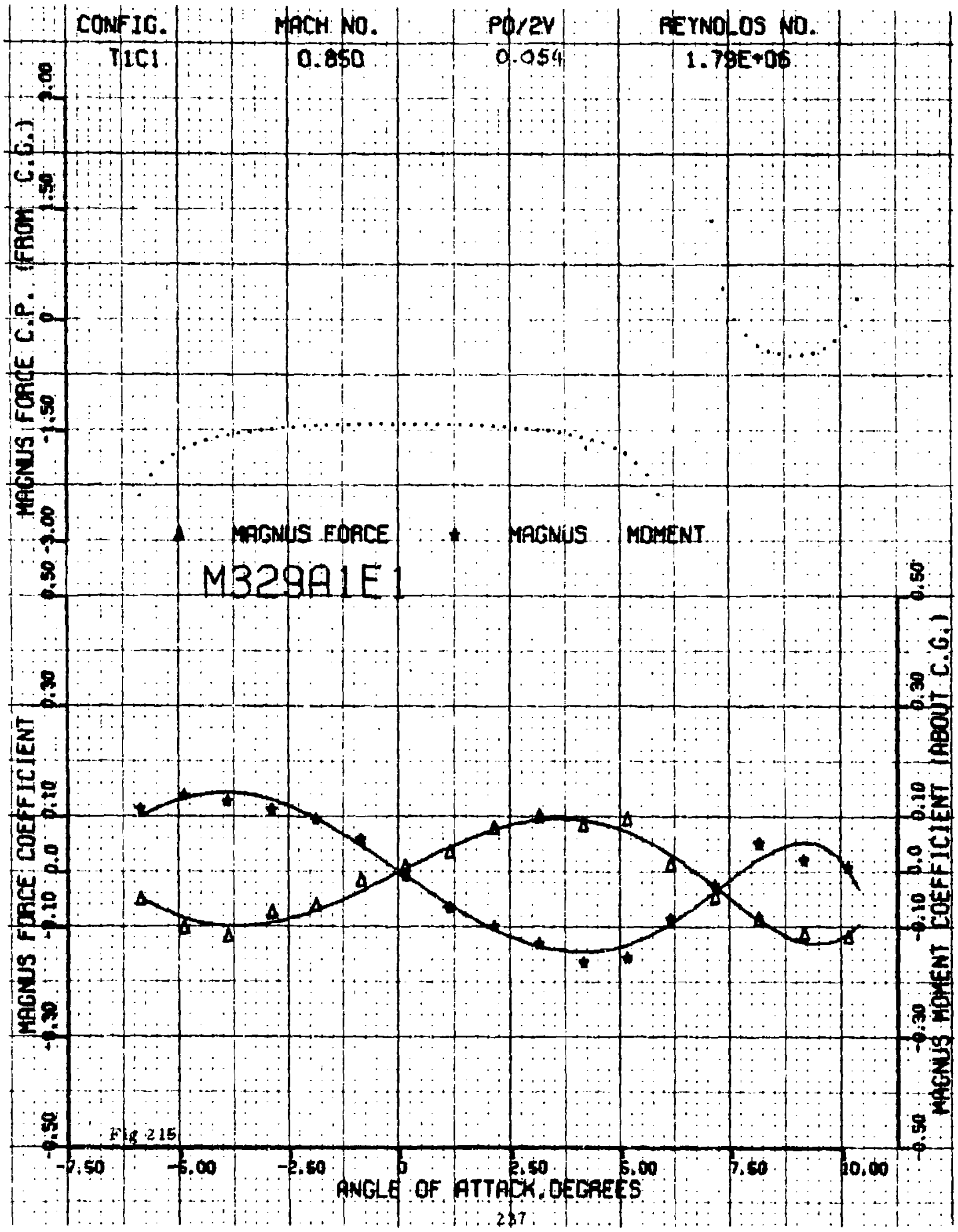


CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.017
REYNOLDS NO.
1.79E+06
[redacted]
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
0.50
0.30
0.10
0.0
-0.10
-0.30
-0.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 213

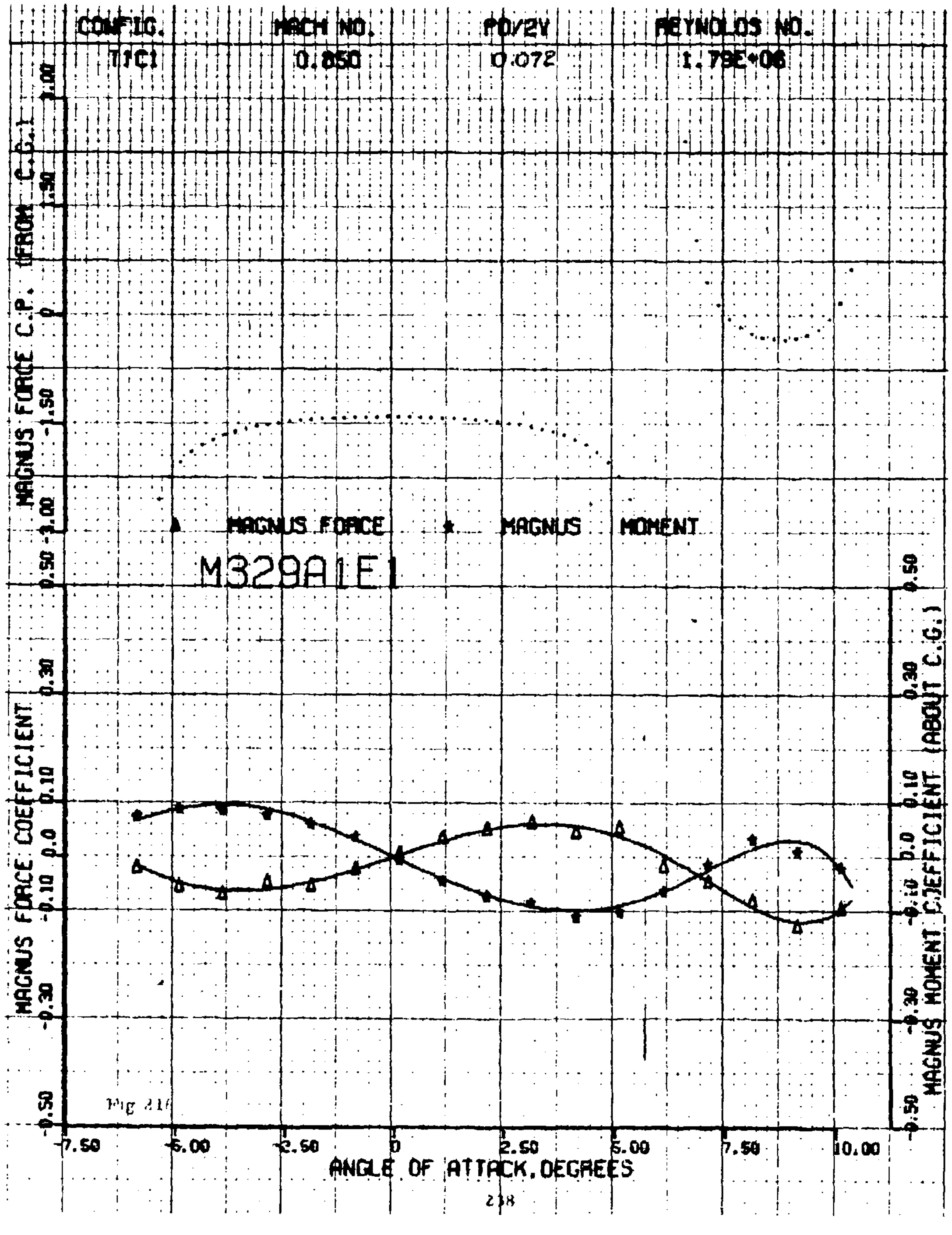


CONFIG. T1C1
MACH NO. 0.850
PD/2V 0.036
REYNOLDS NO. 1.79E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 214



CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.054
REYNOLDS NO.
1.79E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 215


CONFIG.
T7C1
MACH NO.
0.850
PD/2V
0.072
REYNOLDS NO.
1.79E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
Fig 216

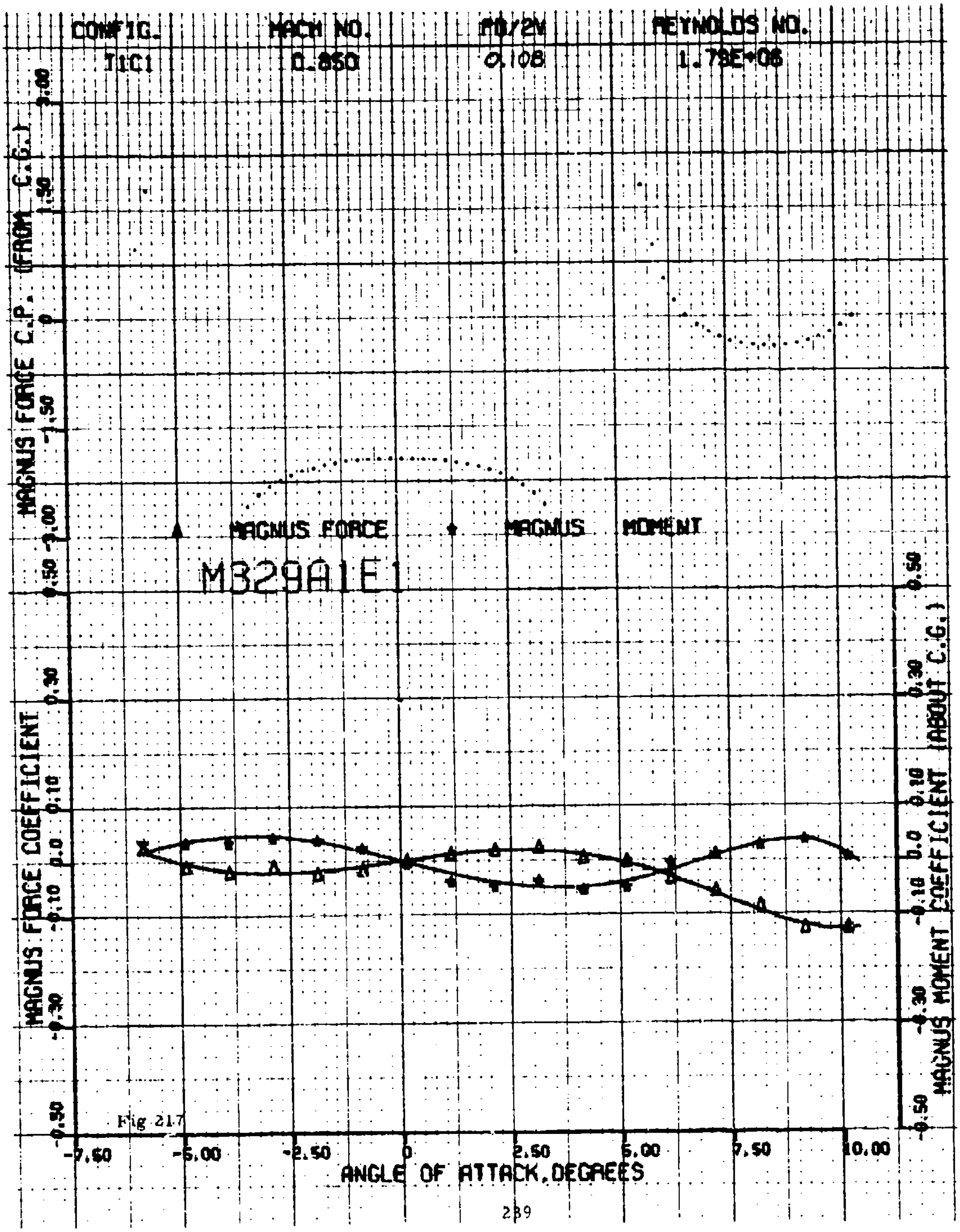
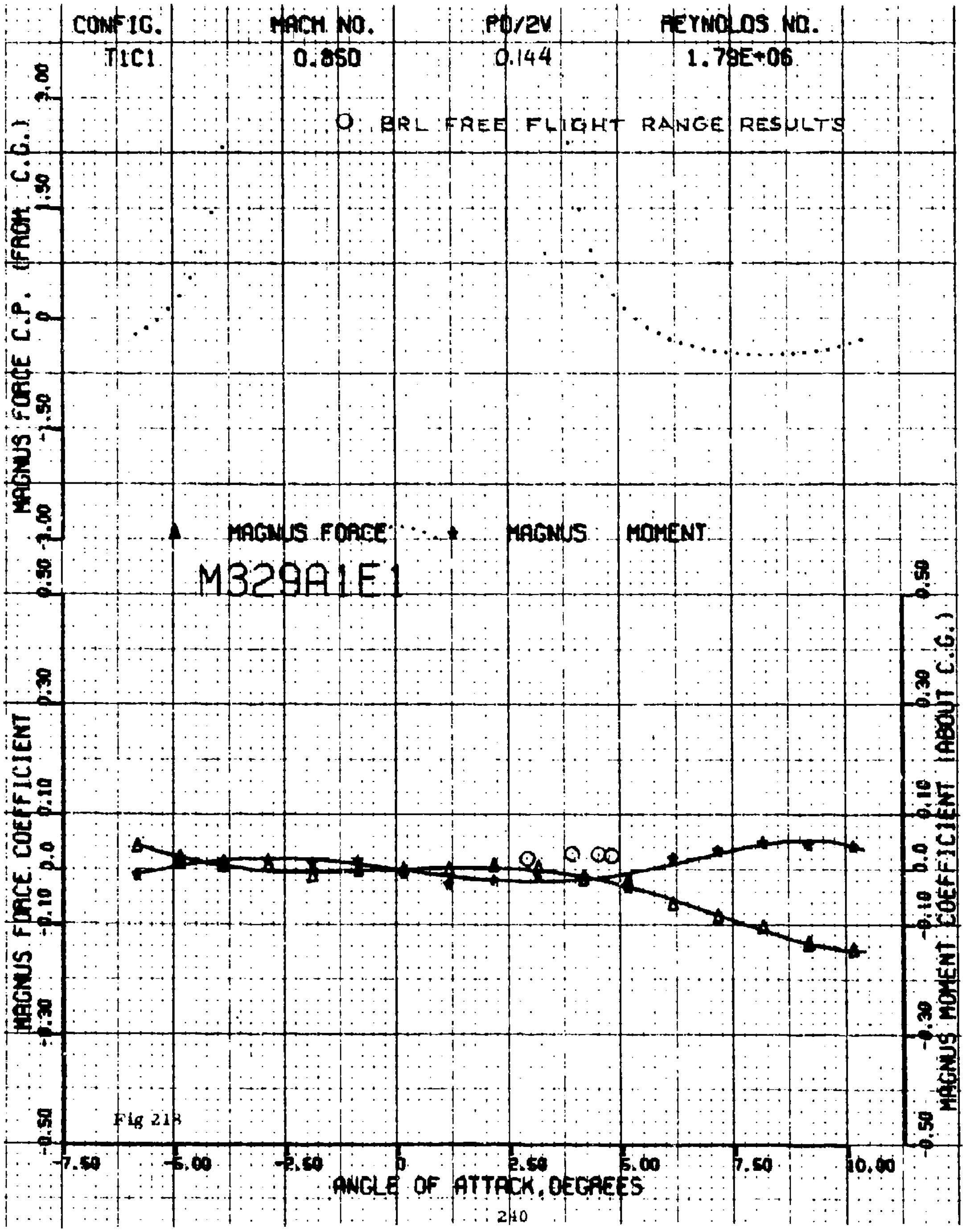

CONFIG.
T1C1
MACH NO.
0.850
ωD/2V
0.108
REYNOLDS NO.
1.79E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 217



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
T1C1
0.850
0.144
1.79E+06
O BRL FREE FLIGHT RANGE RESULTS
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 218

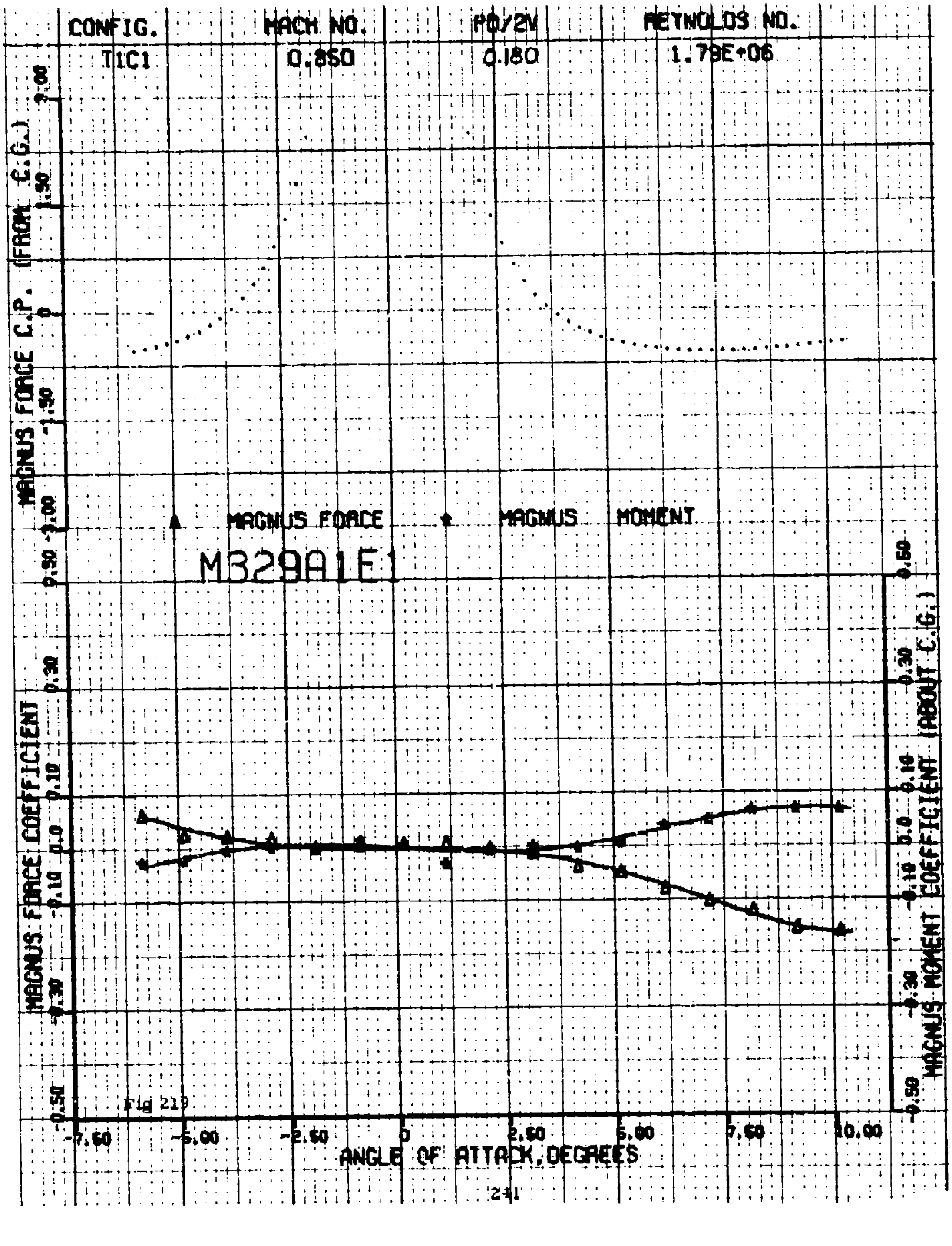
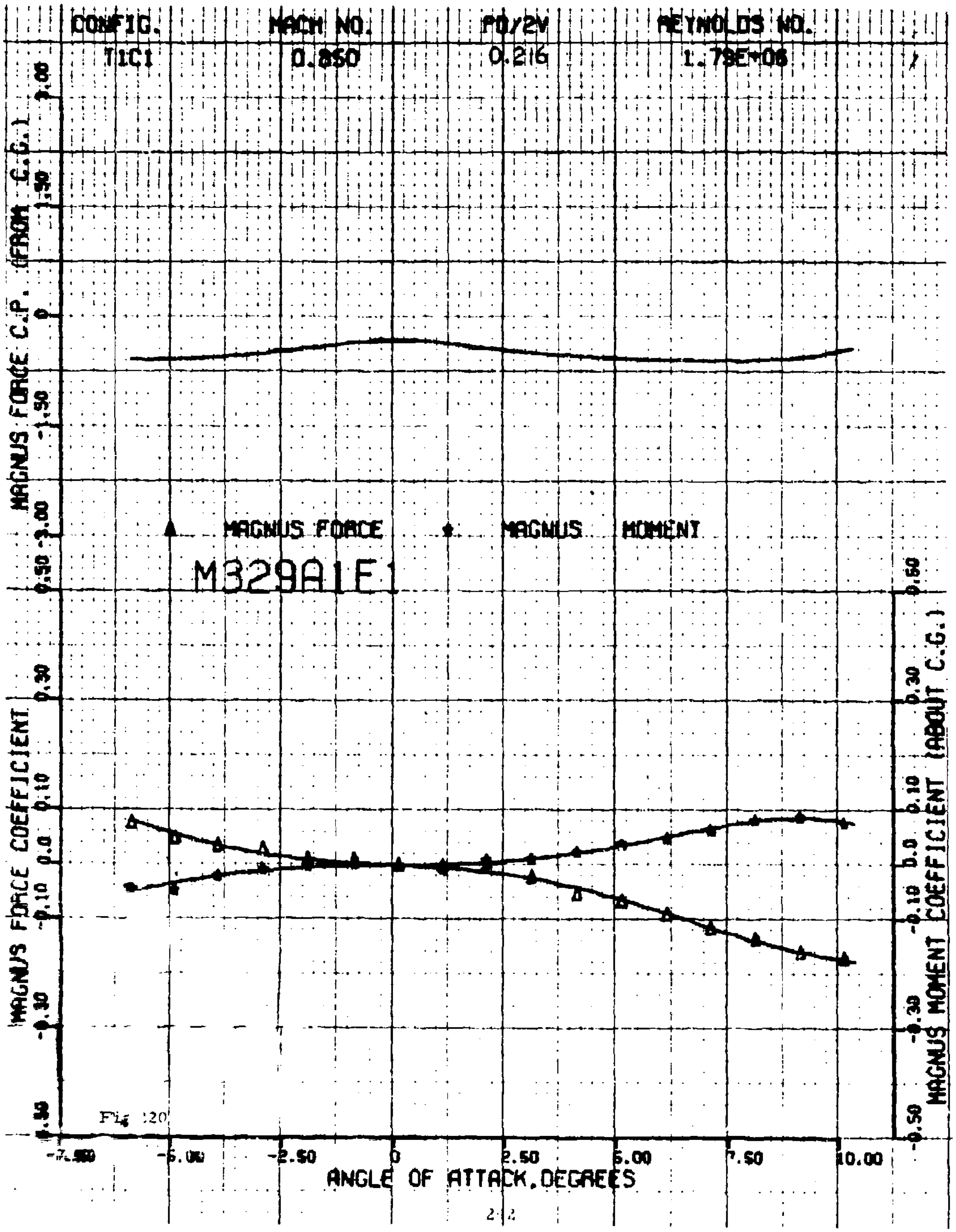
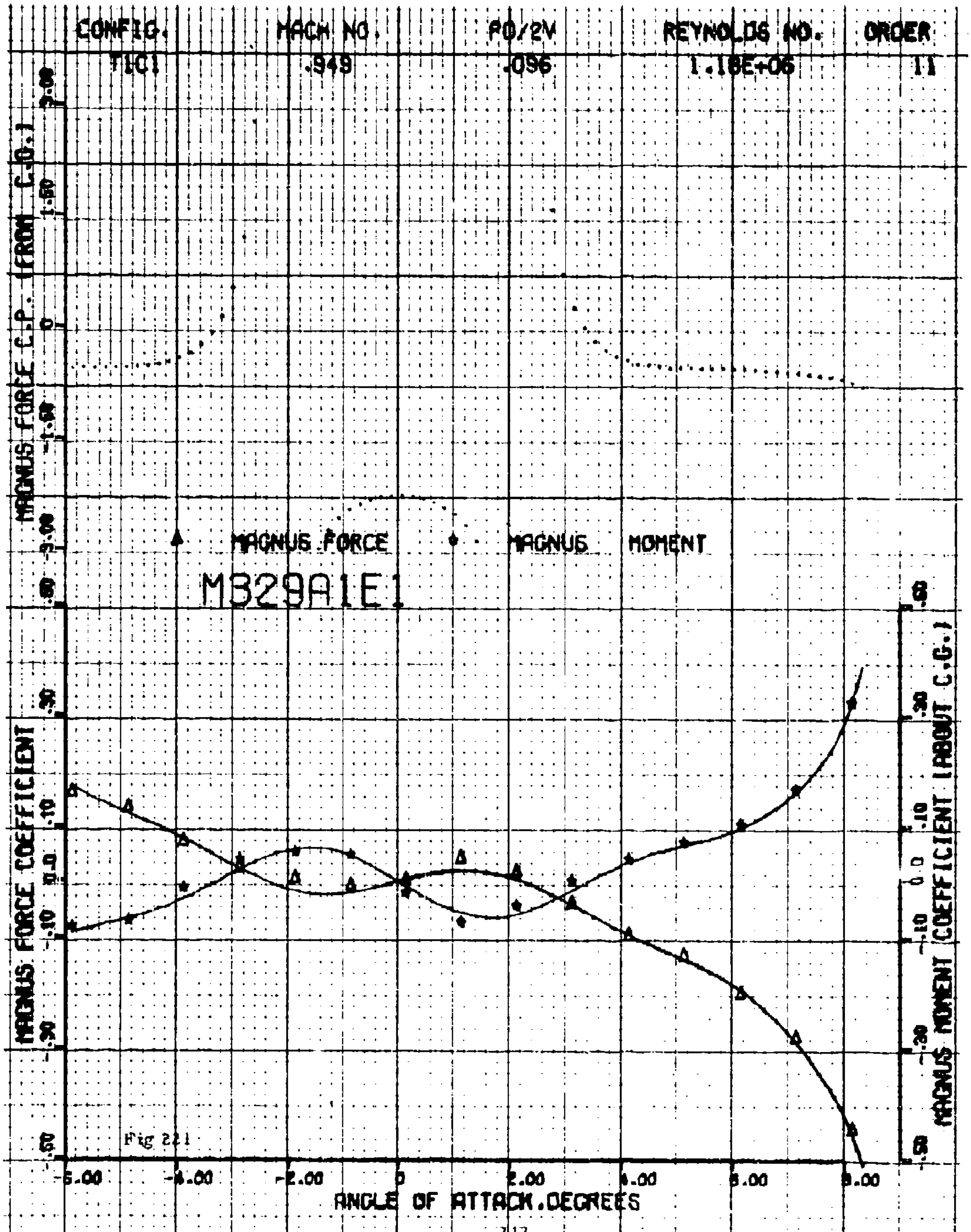

CONFIG.
T1C1
MACH NO.
0.850
PD/2V
0.180
REYNOLDS NO.
1.79E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 219



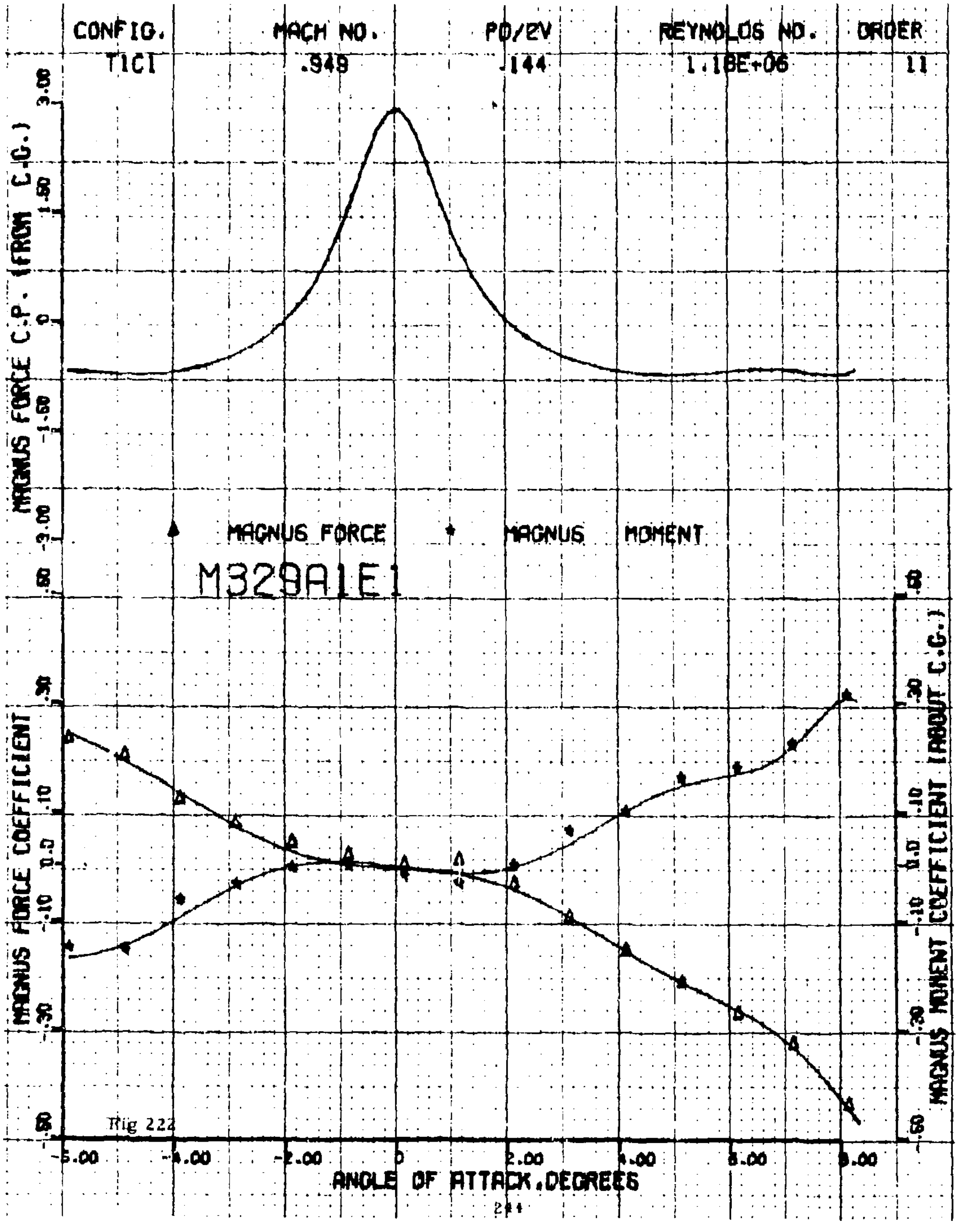
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
T1C1
0.850
0.216
1.79E+06
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

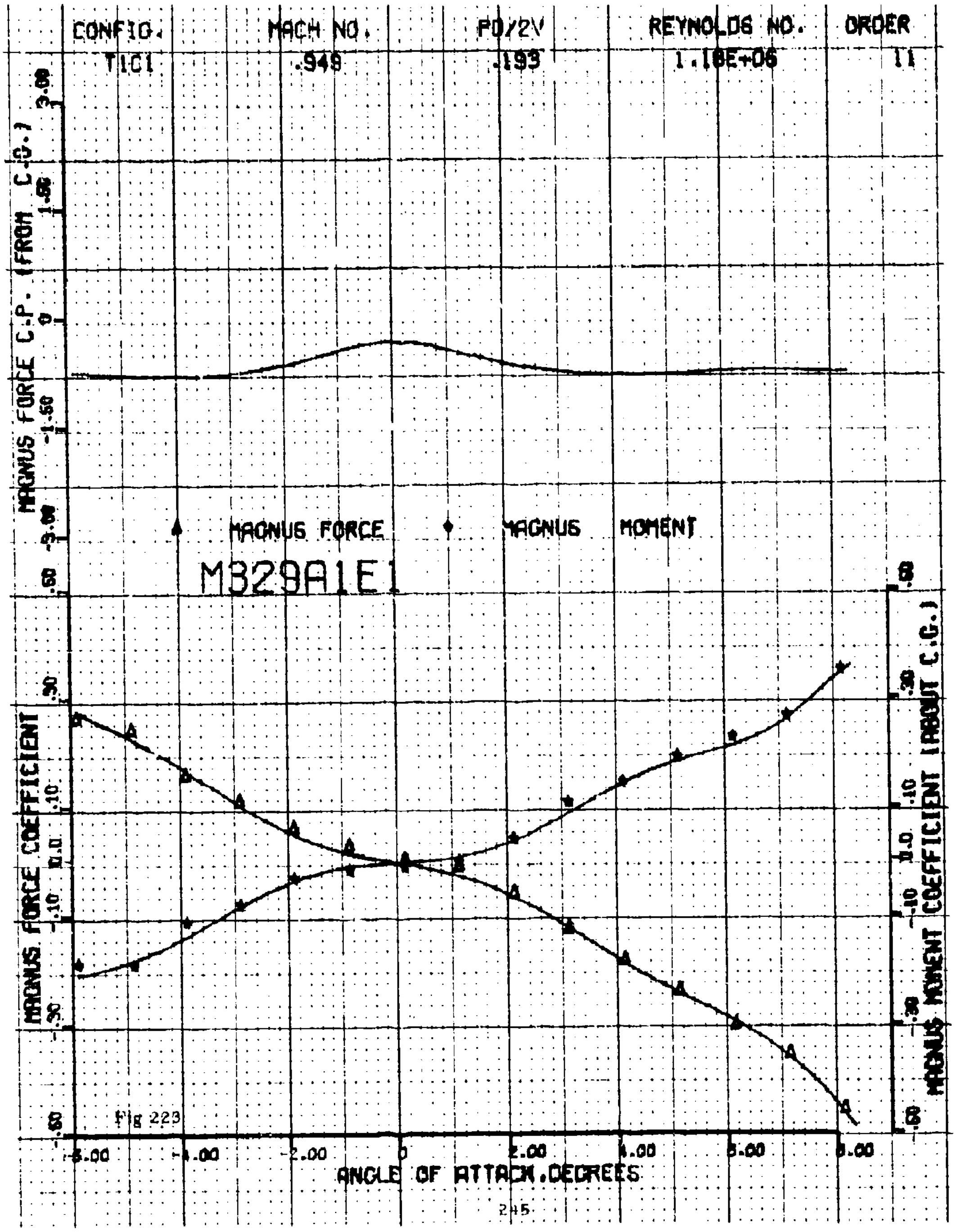
Fig. 120



CONFIG.
T1C1
MACH NO.
.949
PD/2V
.096
REYNOLDS NO.
1.18E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
2.00
1.00
0
-1.00
-2.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-4.00
-2.00
0
2.00
4.00
6.00
8.00
ANGLE OF ATTACK, DEGREES

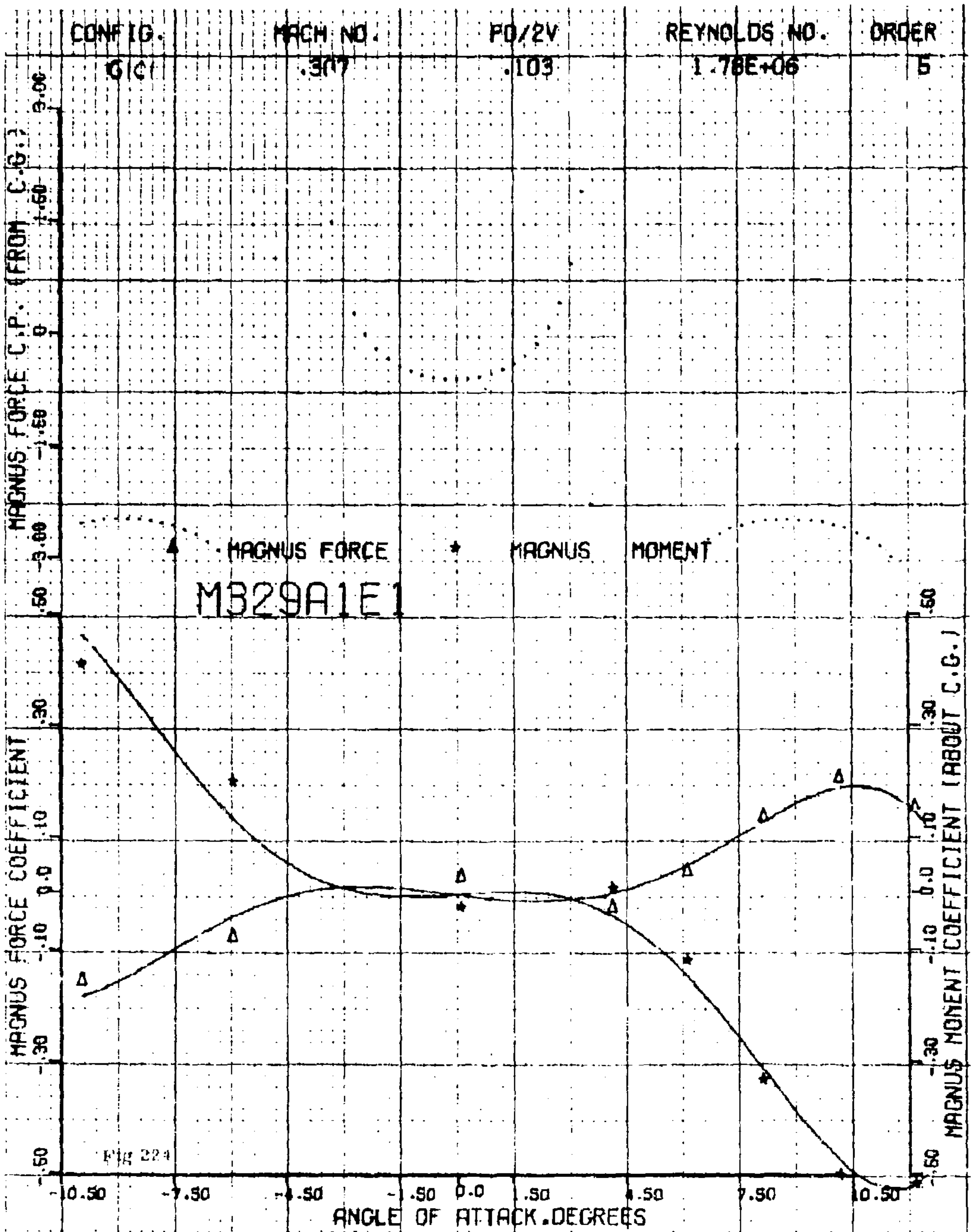
Fig 221


CONFIG.
T1C1
MACH NO.
.949
PD/2V
.144
REYNOLDS NO.
1.18E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.50
.30
.10
0.0
-.10
-.30
-.50
-6.00
-4.00
-2.00
0
2.00
4.00
6.00
8.00
ANGLE OF ATTACK,DEGREES
Fig 222



CONFIG.
TIC1
MACH NO.
.949
PD/2V
.193
REYNOLDS NO.
1.18E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 223



CONFIG.
MACH NO.
.307
PD/2V
.103
REYNOLDS NO.
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-10.50
-7.50
-4.50
-1.50
0.0
1.50
4.50
7.50
10.50
ANGLE OF ATTACK, DEGREES

Fig 224

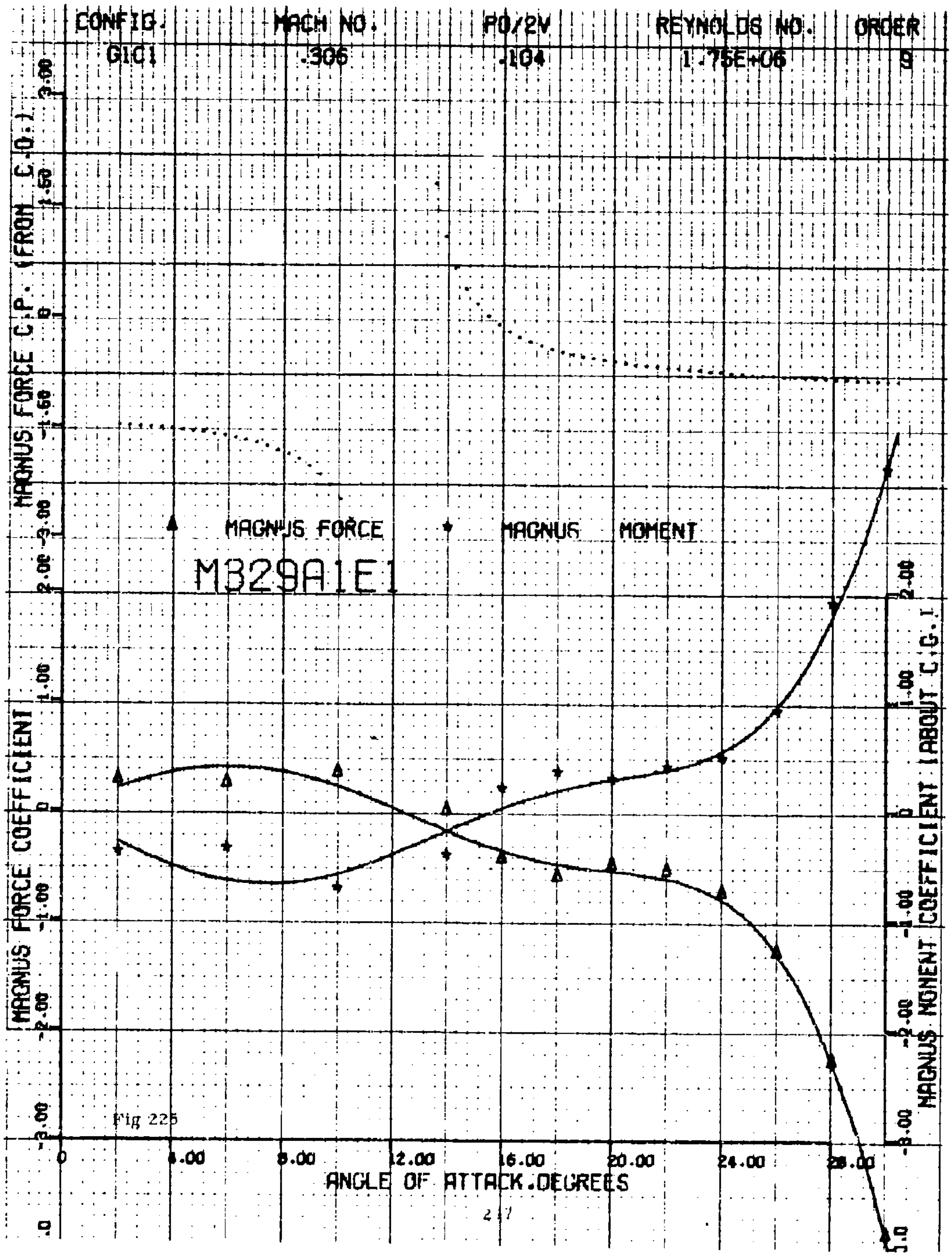
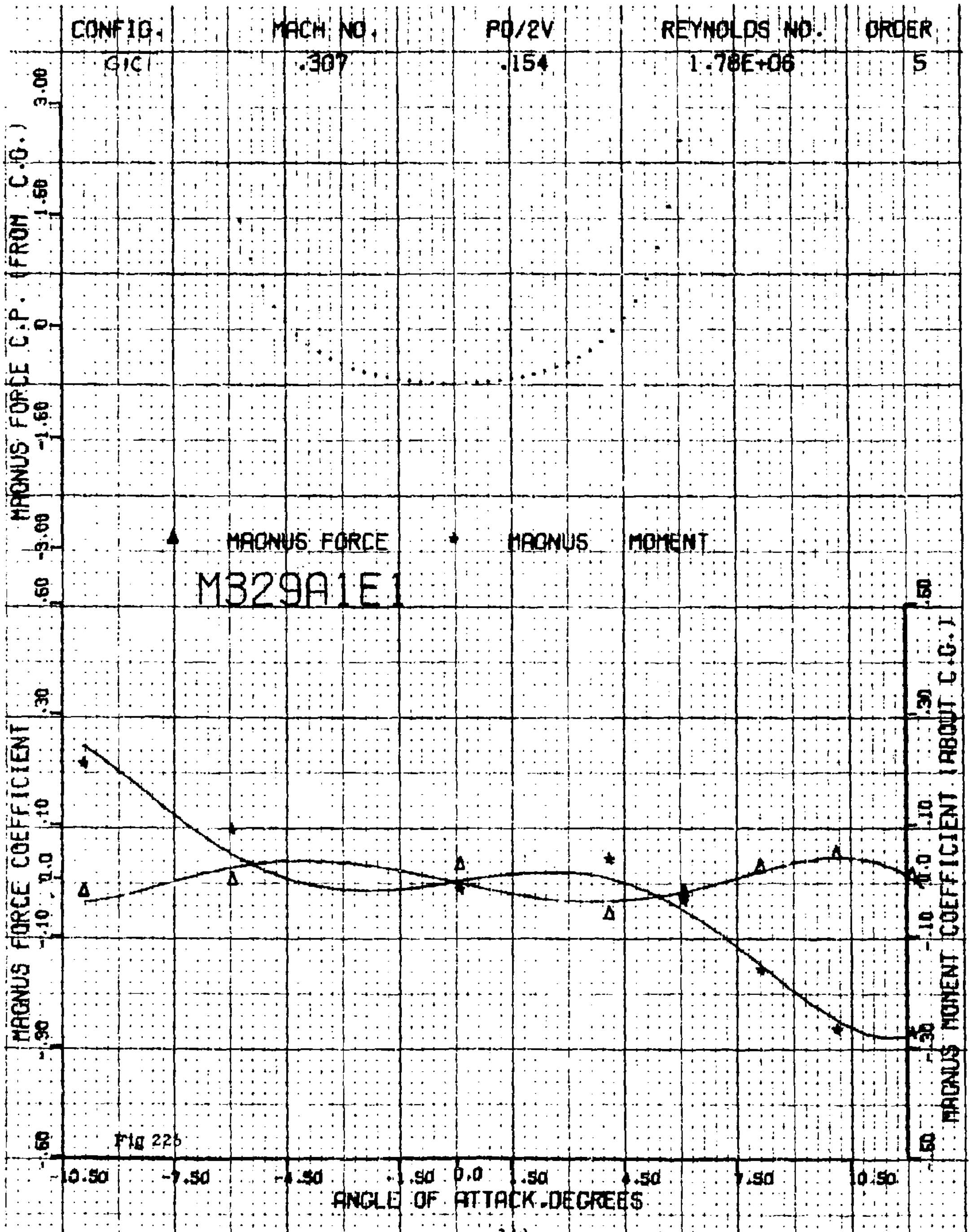
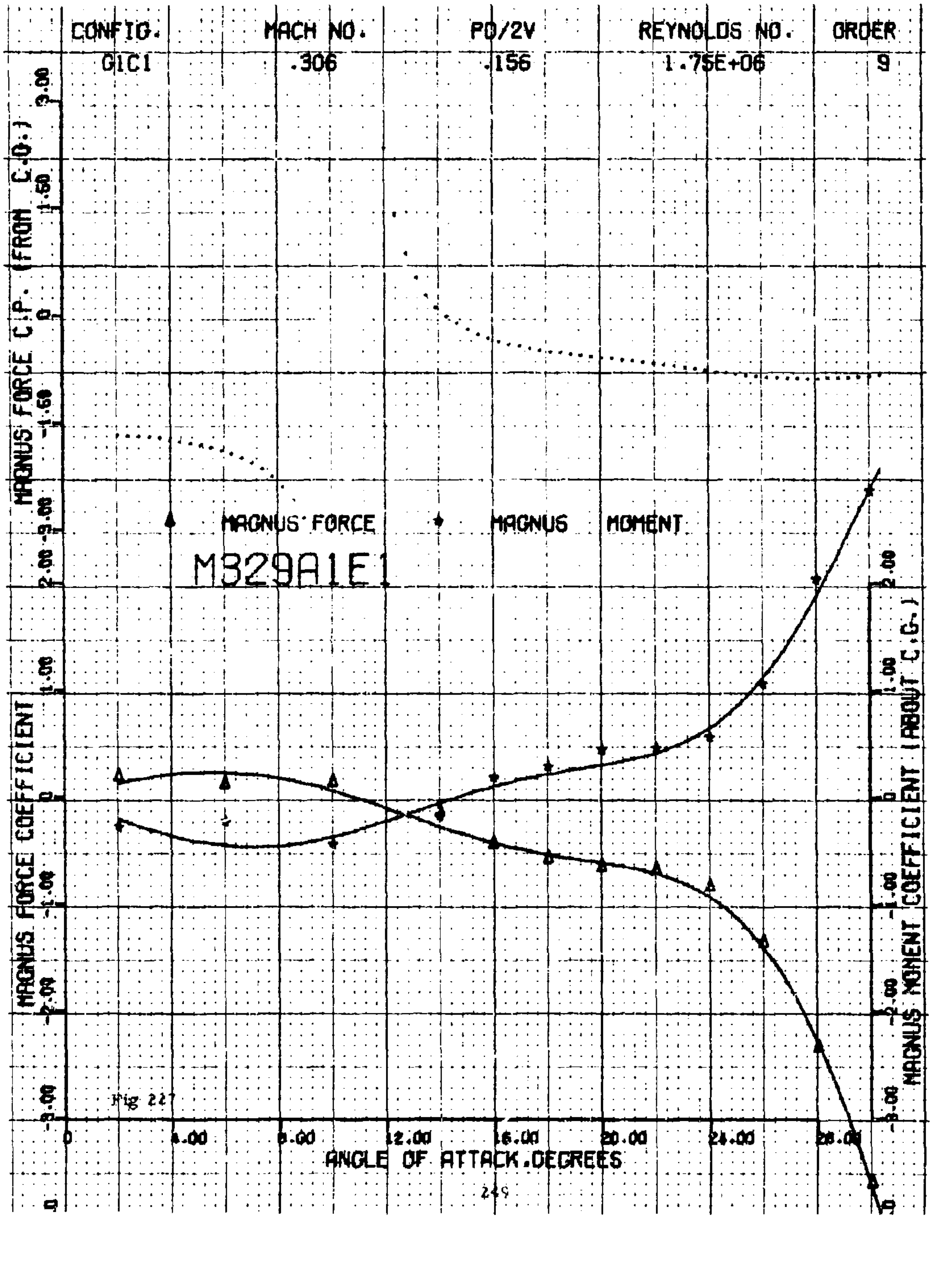

CONFIG. GIC1
MACH NO. .306
PD/2V .104
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

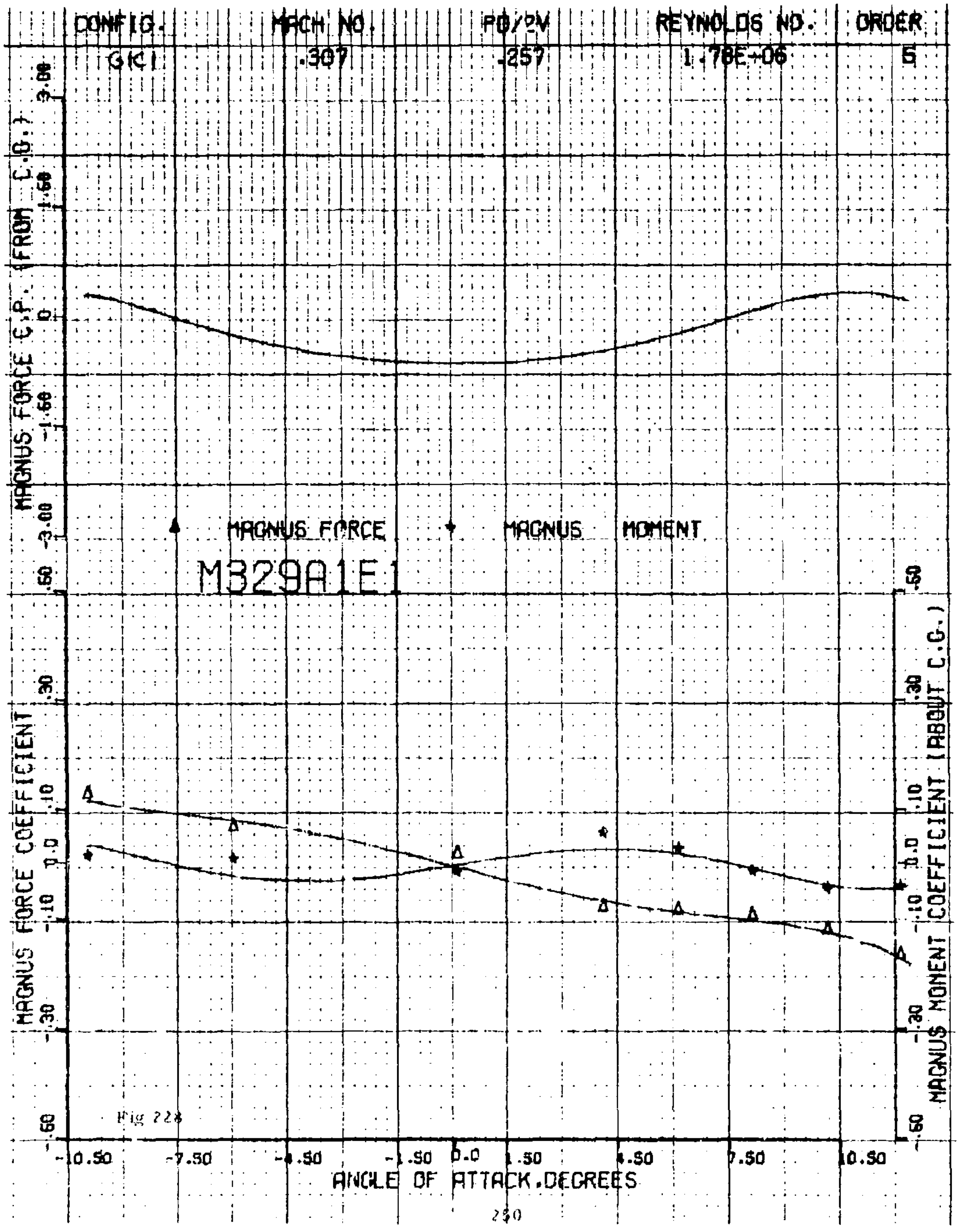
Fig 226


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
GICI
.307
.154
1.78E+06
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 226
ANGLE OF ATTACK,DEGREES



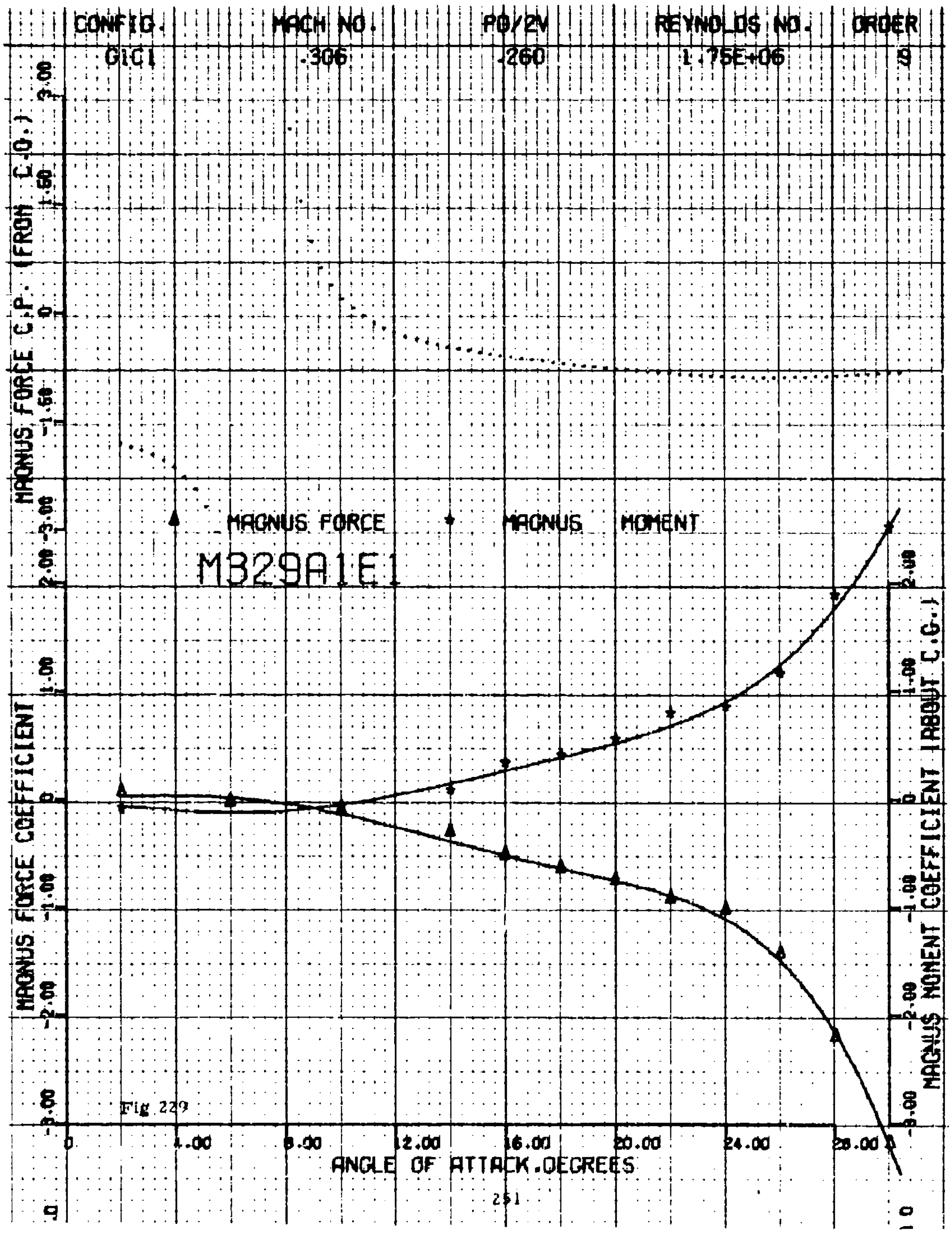
CONFIG. GICI
MACH NO. .306
PD/2V .156
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 227



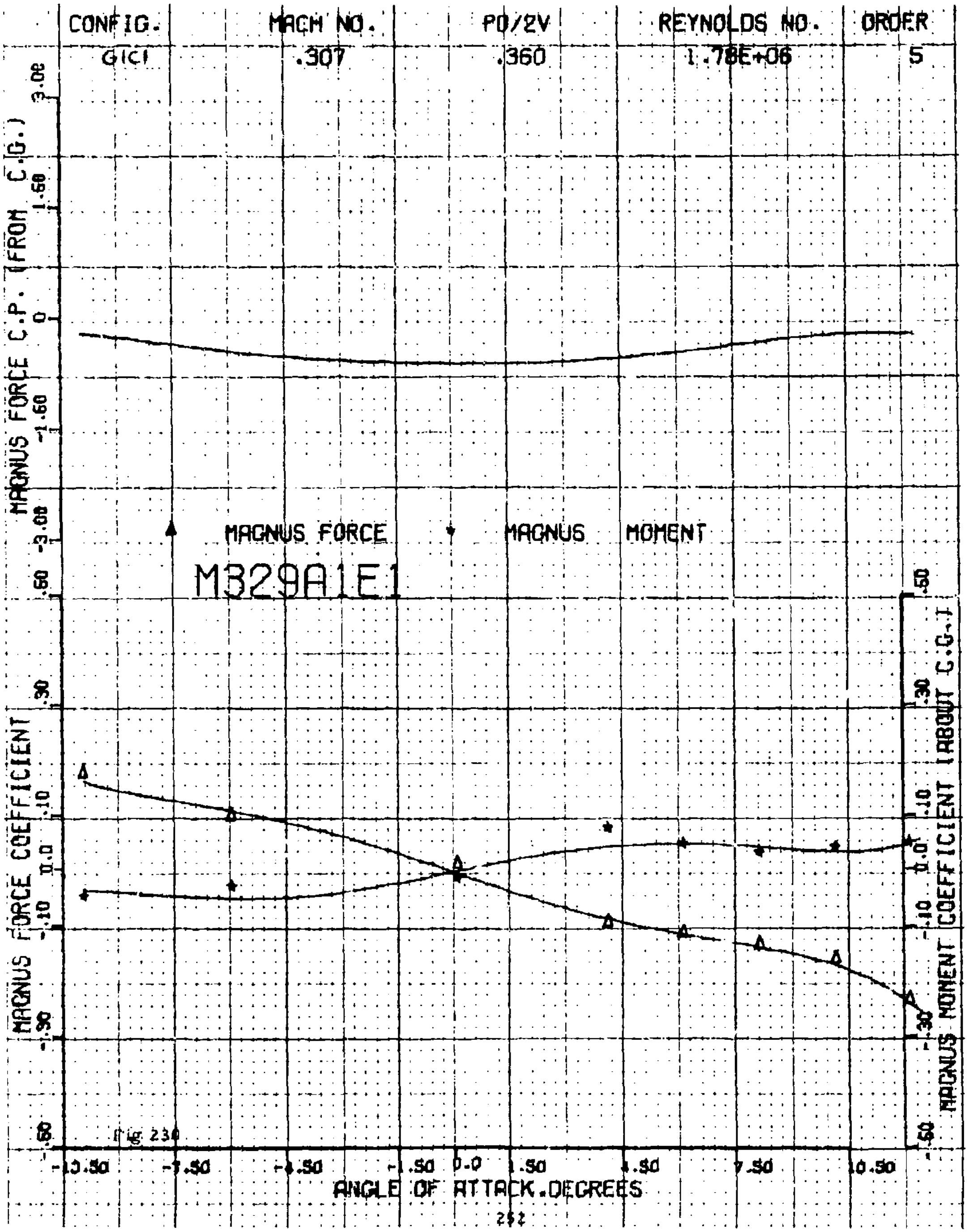
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
GKI .307 .257 1.78E+06 5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.50
.30
.10
0.0
-.10
-.30
-.50
-10.50
-7.50
-4.50
-1.50
0.0
1.50
4.50
7.50
10.50
ANGLE OF ATTACK, DEGREES

Fig 228



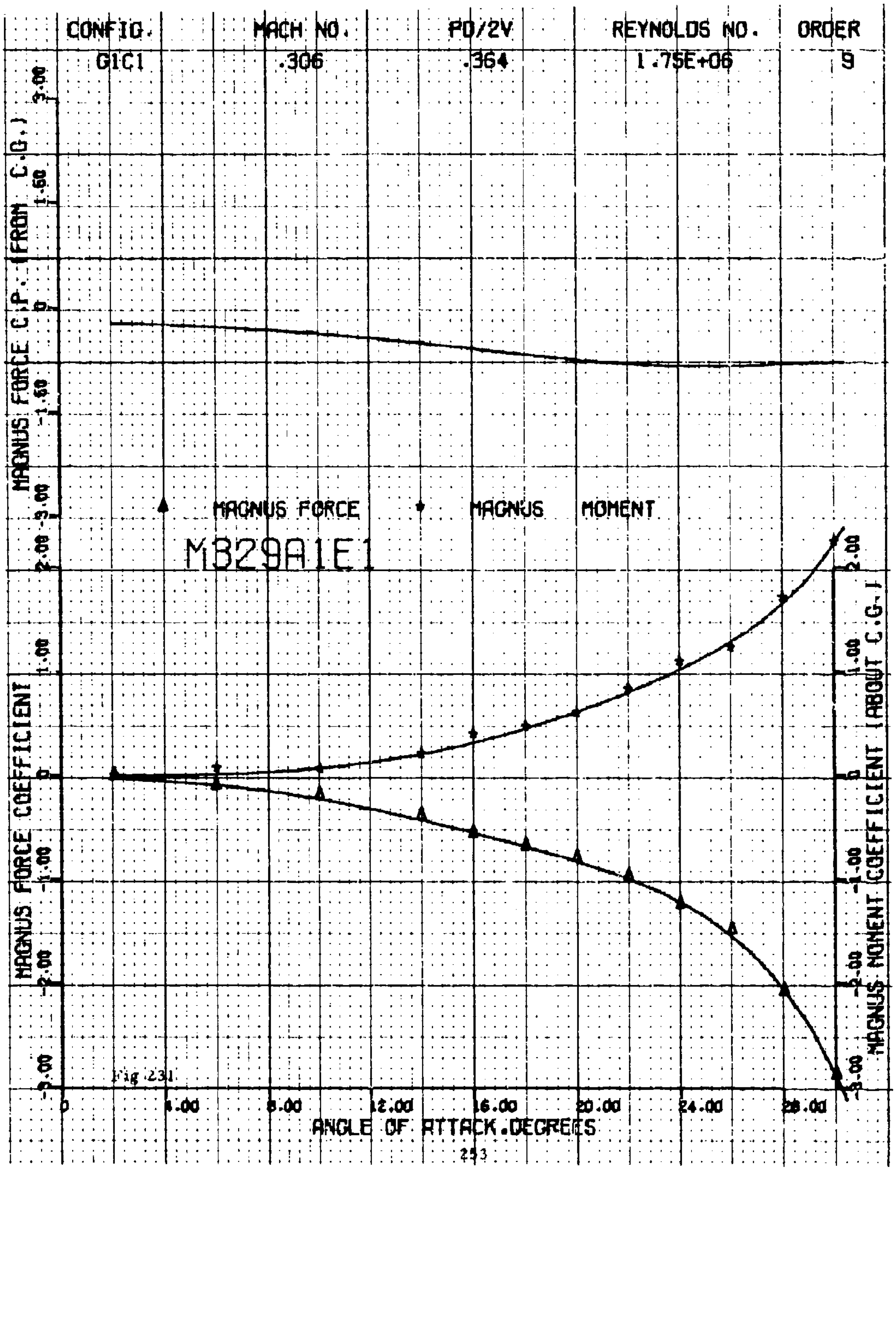
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
G1C1 .306 .260 1.75E+06 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 229



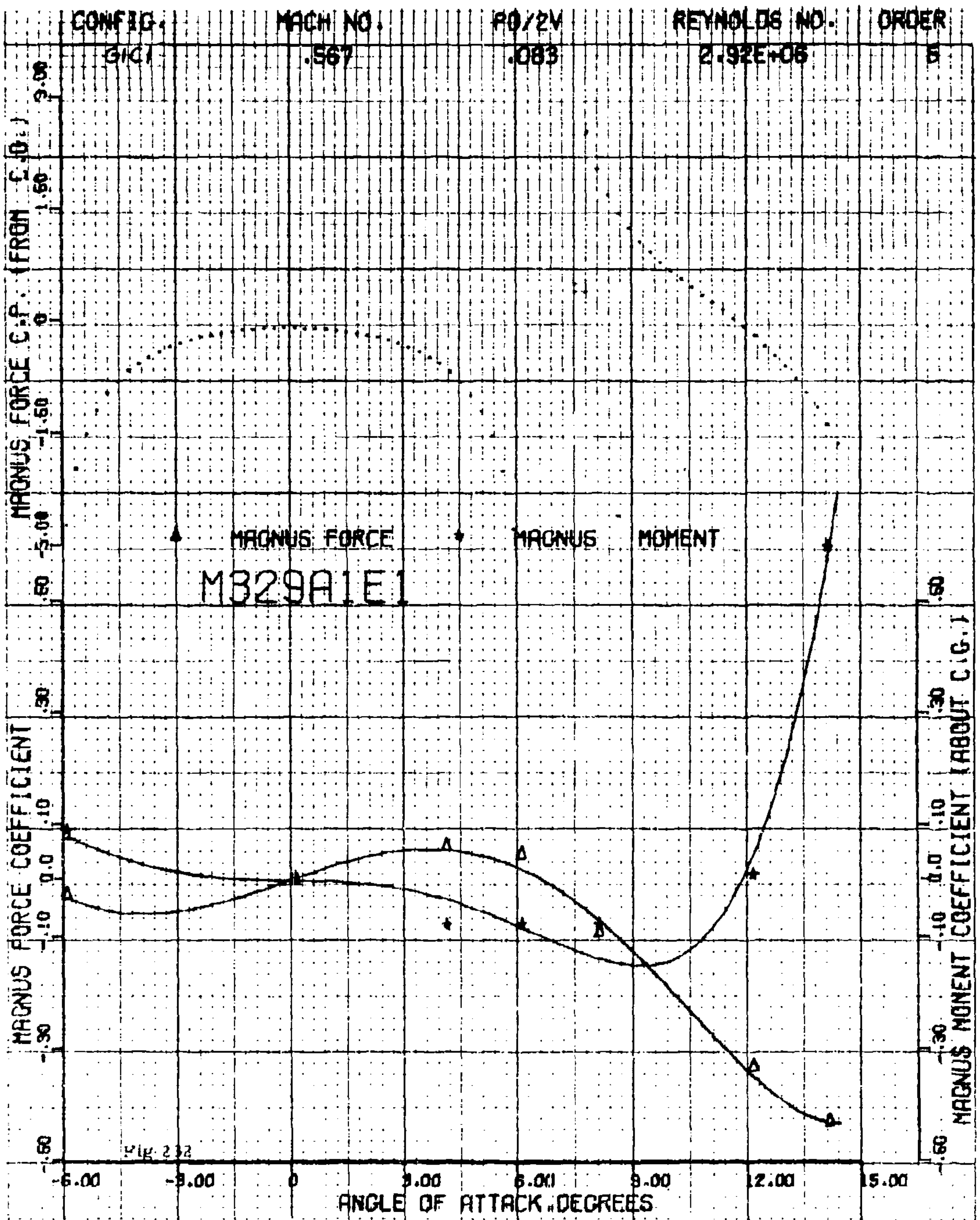
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
G1C1 .307 .360 1.78E+06 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK.DEGREES

Fig 230



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
G1C1
.306
.364
1.75E+06
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 231



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
G1C1
.567
.083
2.92E+06
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

Fig. 232

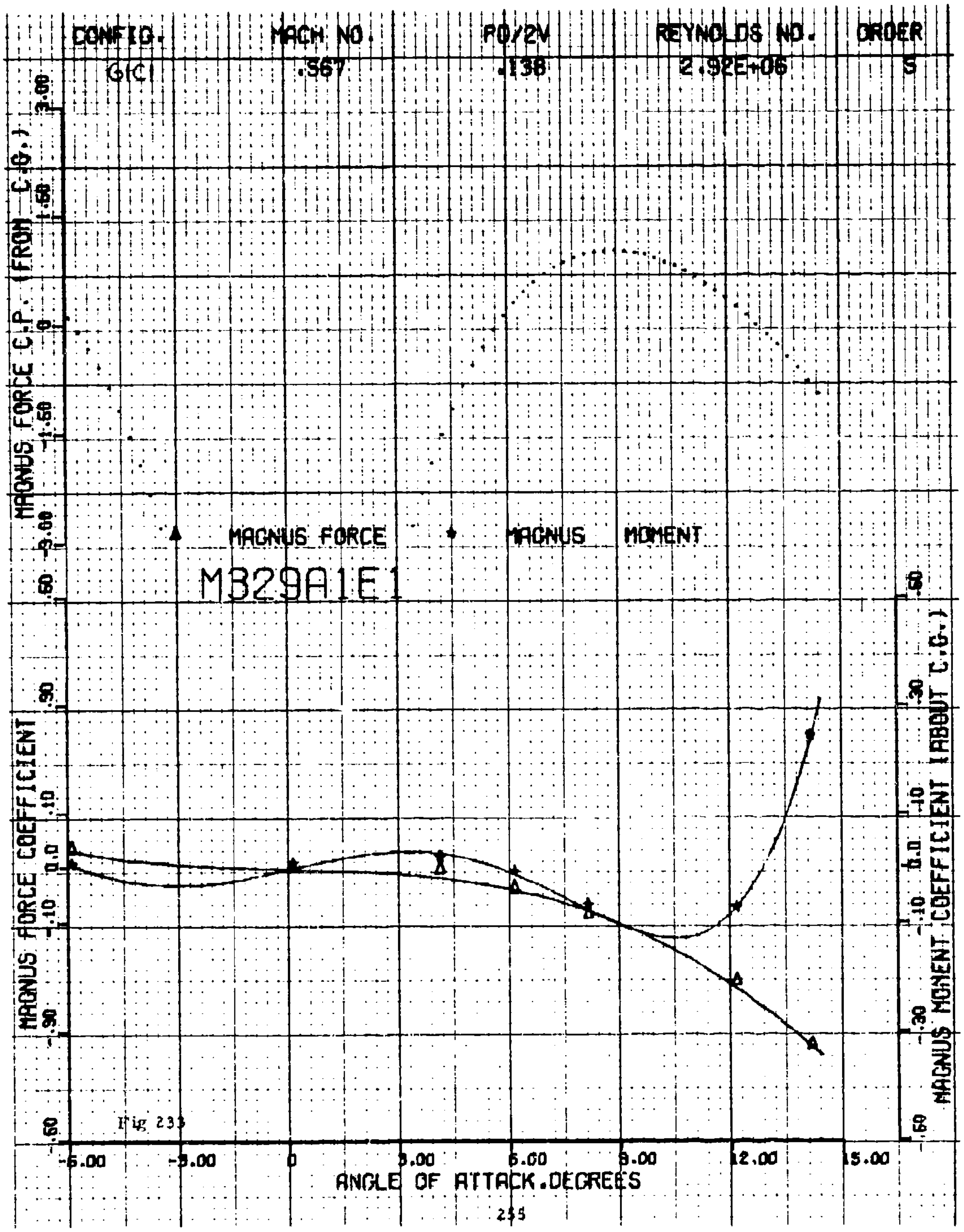
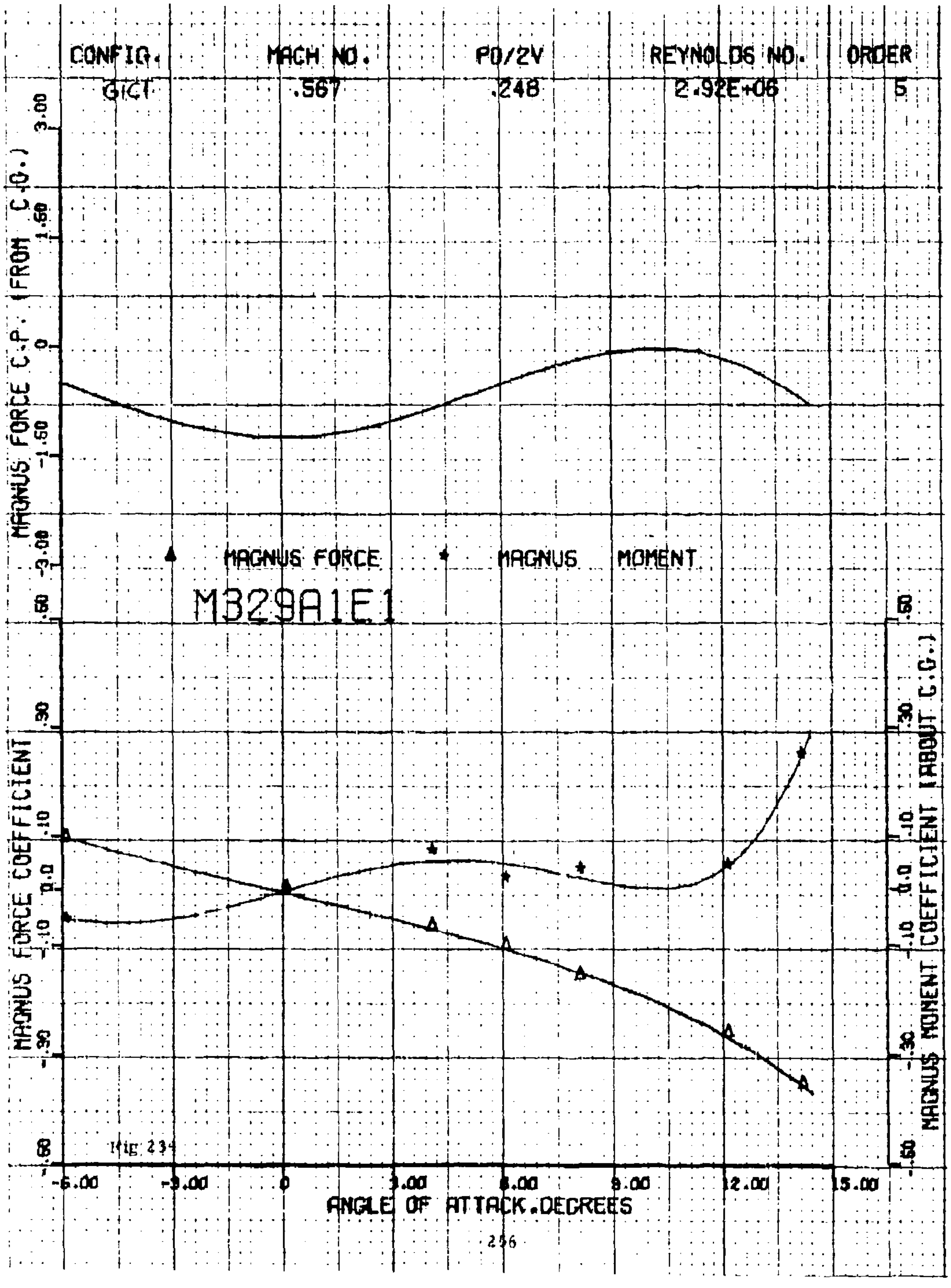
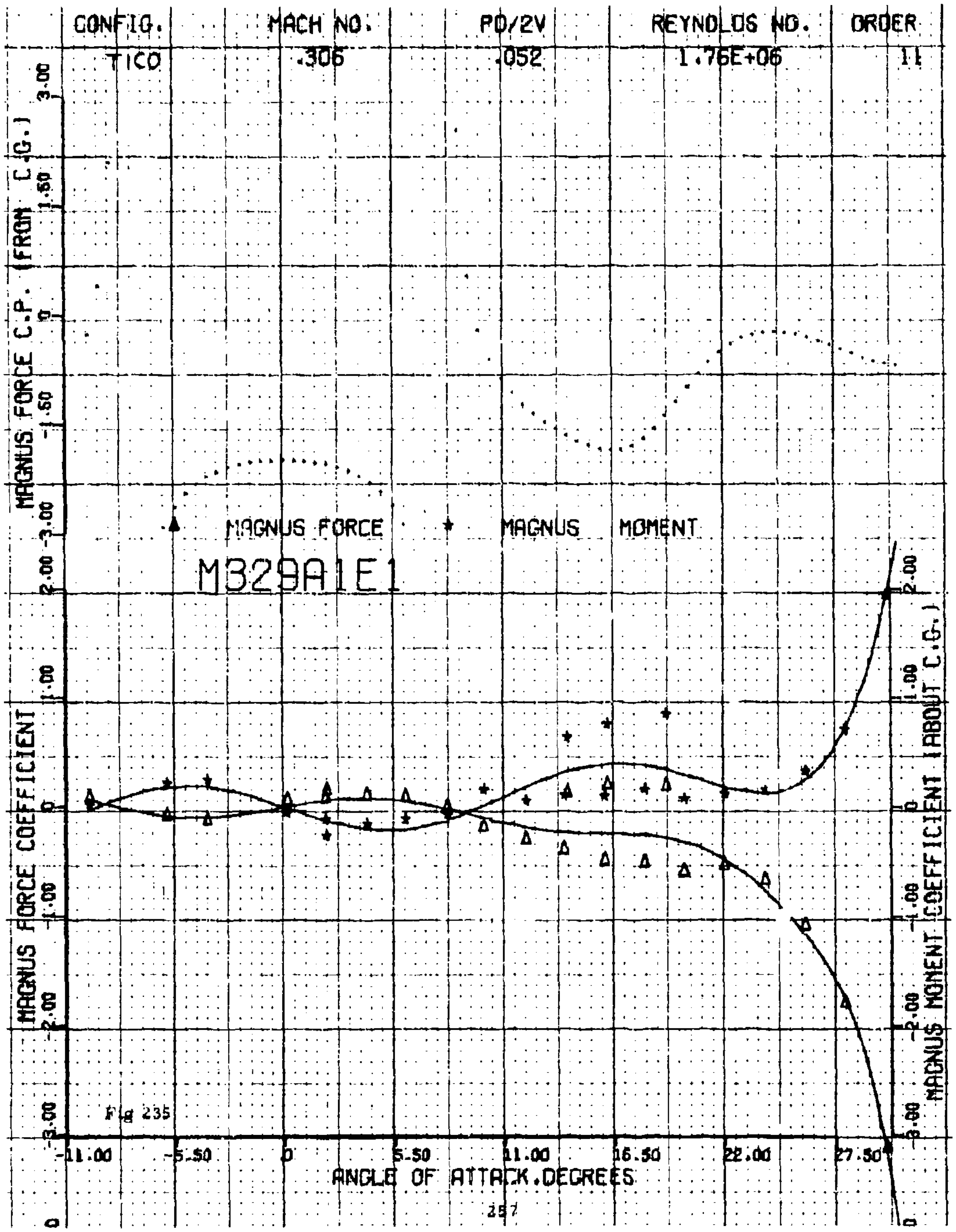

CONFIG.
G(C)
MACH NO.
.567
PD/2V
.138
REYNOLDS NO.
2.92E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00

Fig 233

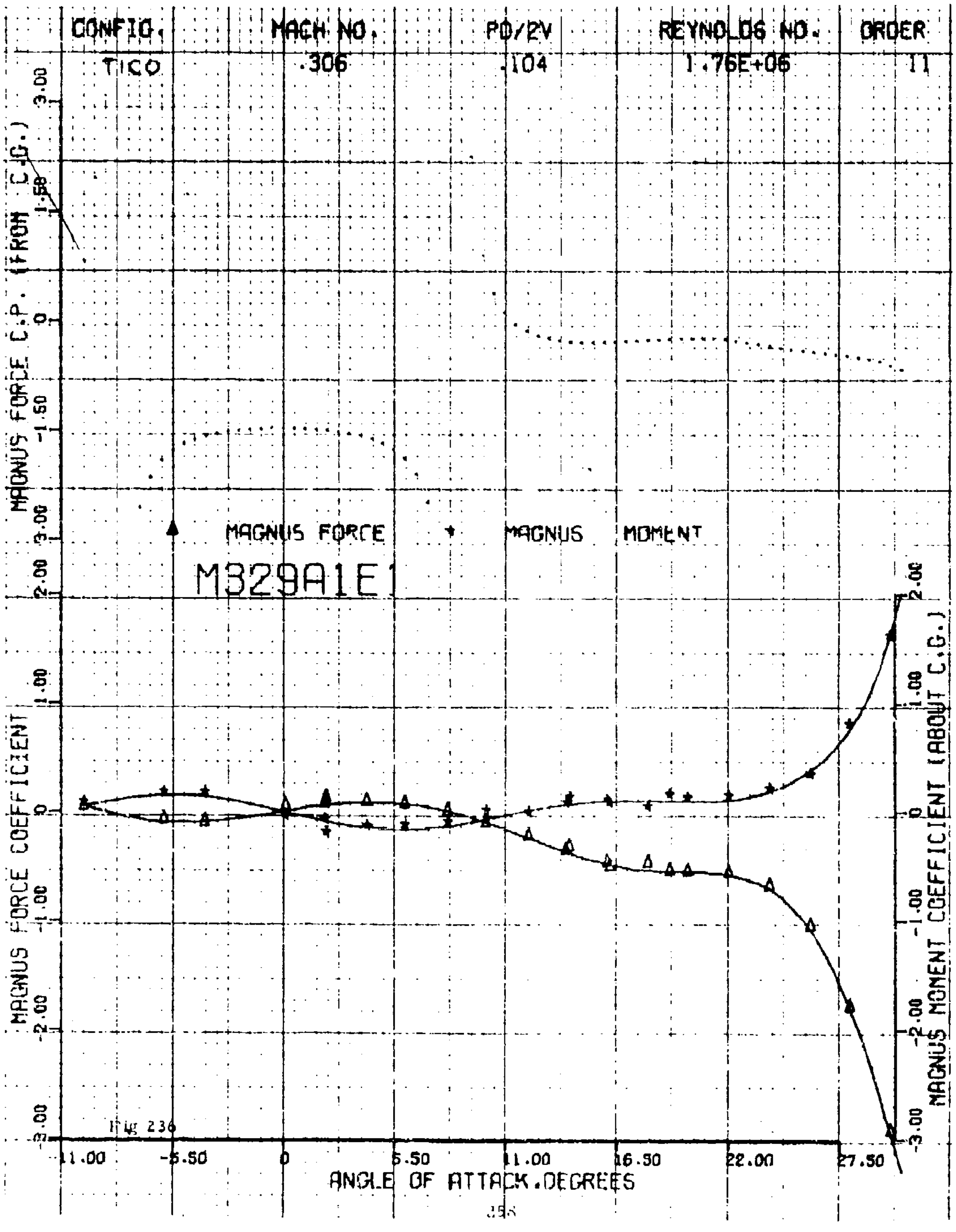


CONFIG.
GICI
MACH NO.
.567
PD/2V
.248
REYNOLDS NO.
2.92E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

Fig. 234

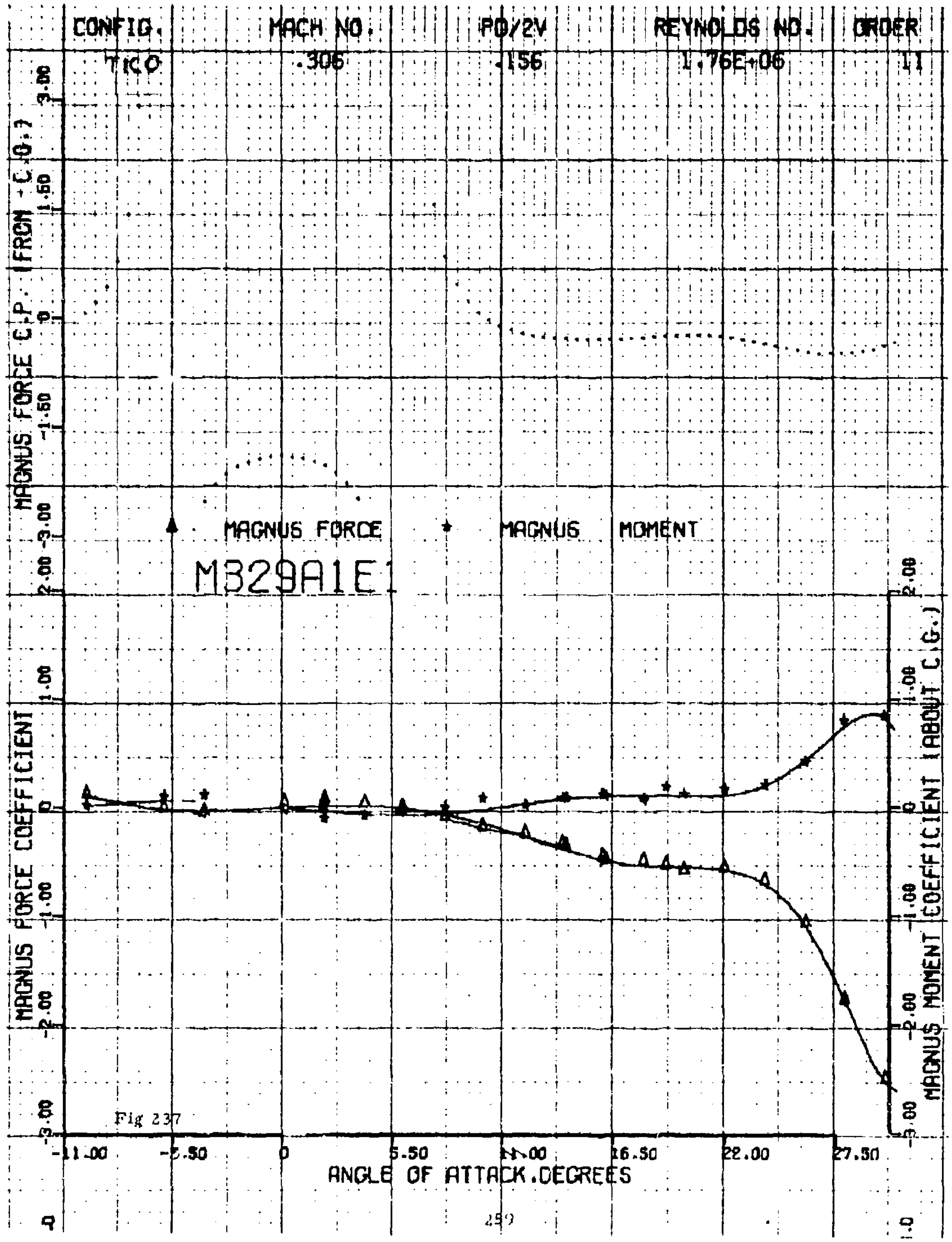


CONFIG. TICO
MACH NO. .306
PD/2V .052
REYNOLDS NO. 1.76E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
Fig 235



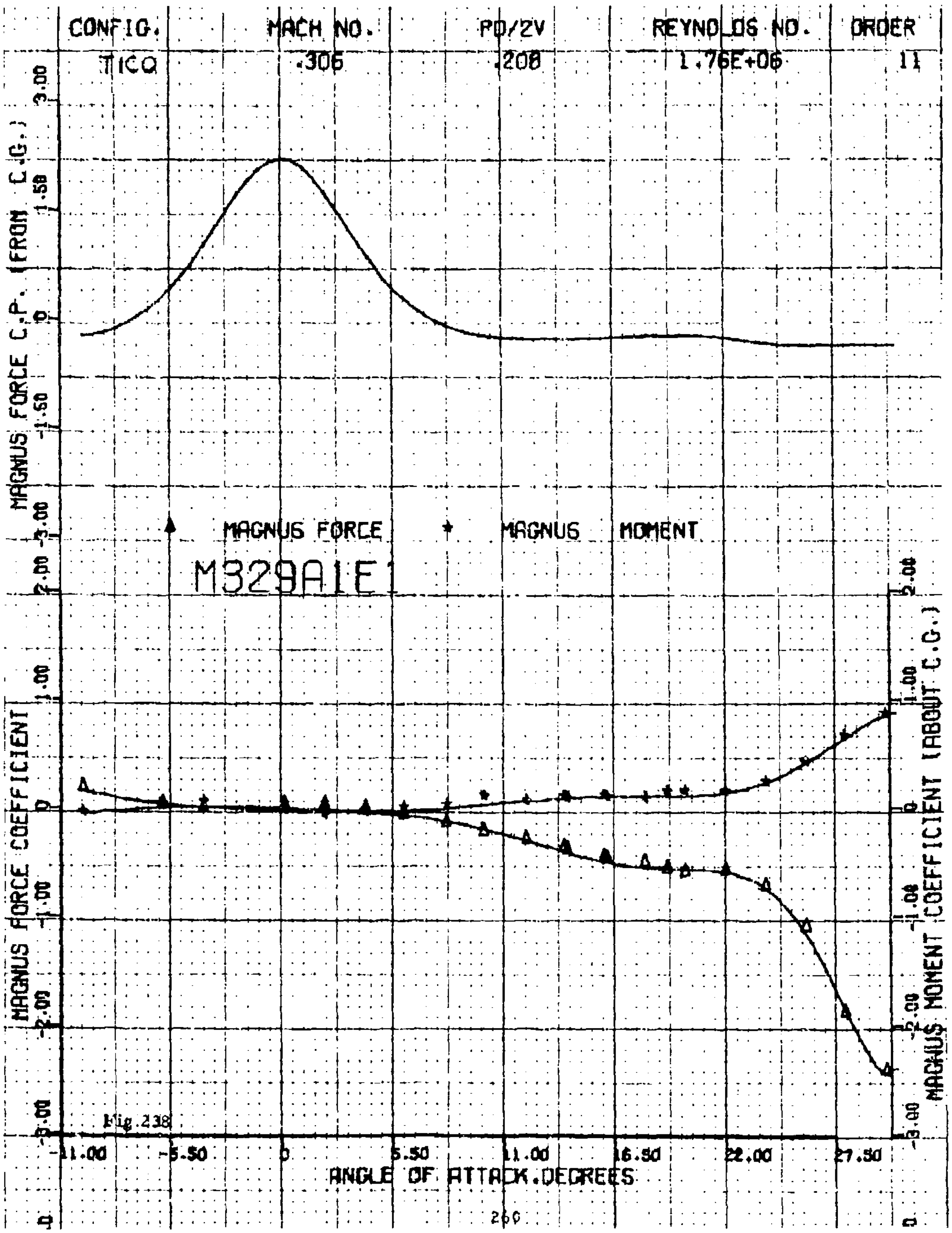
CONFIG. TICO
MACH NO. .306
PD/2V .104
REYNOLDS NO. 1.76E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 236



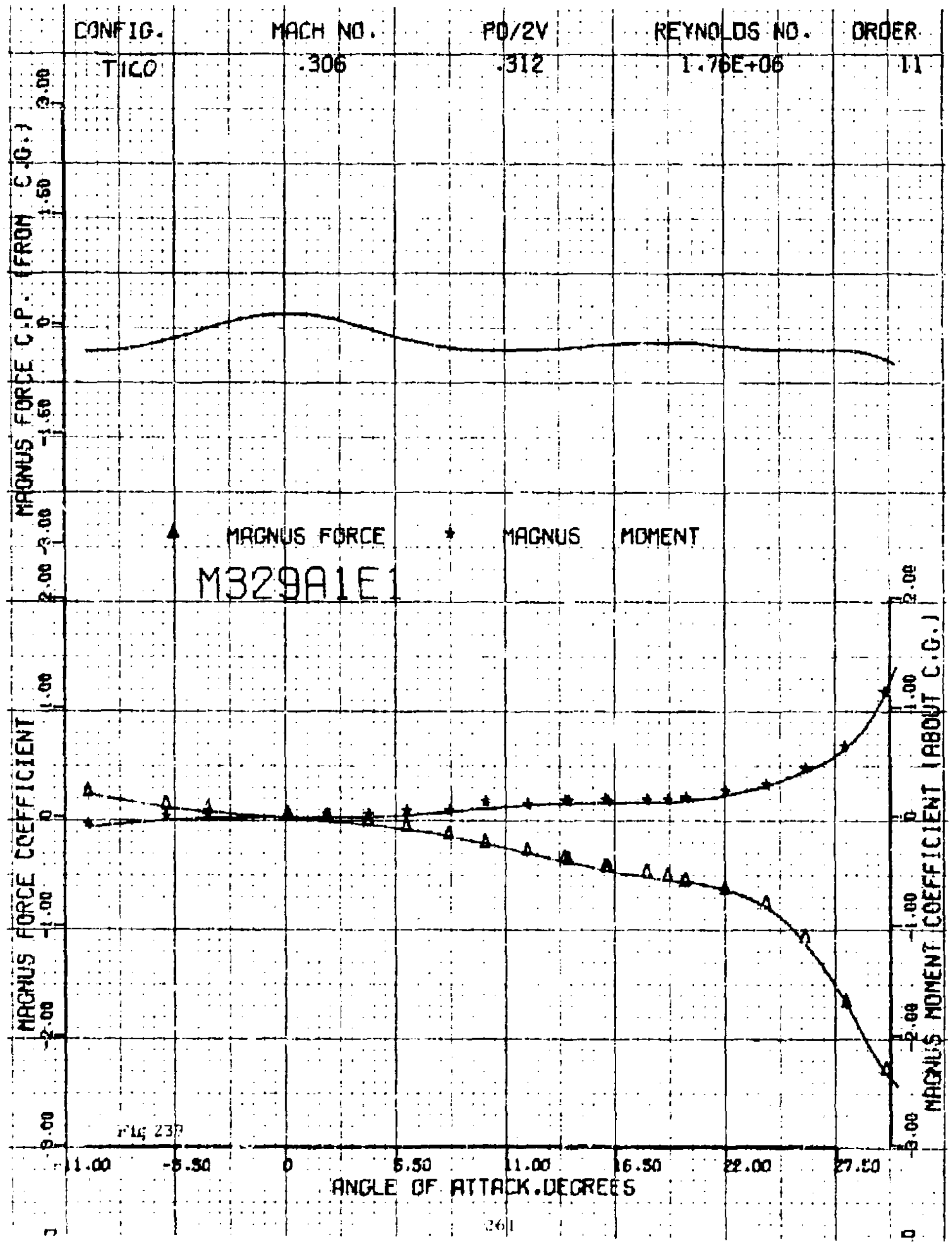
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1CO
.306
.156
1.76E+06
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

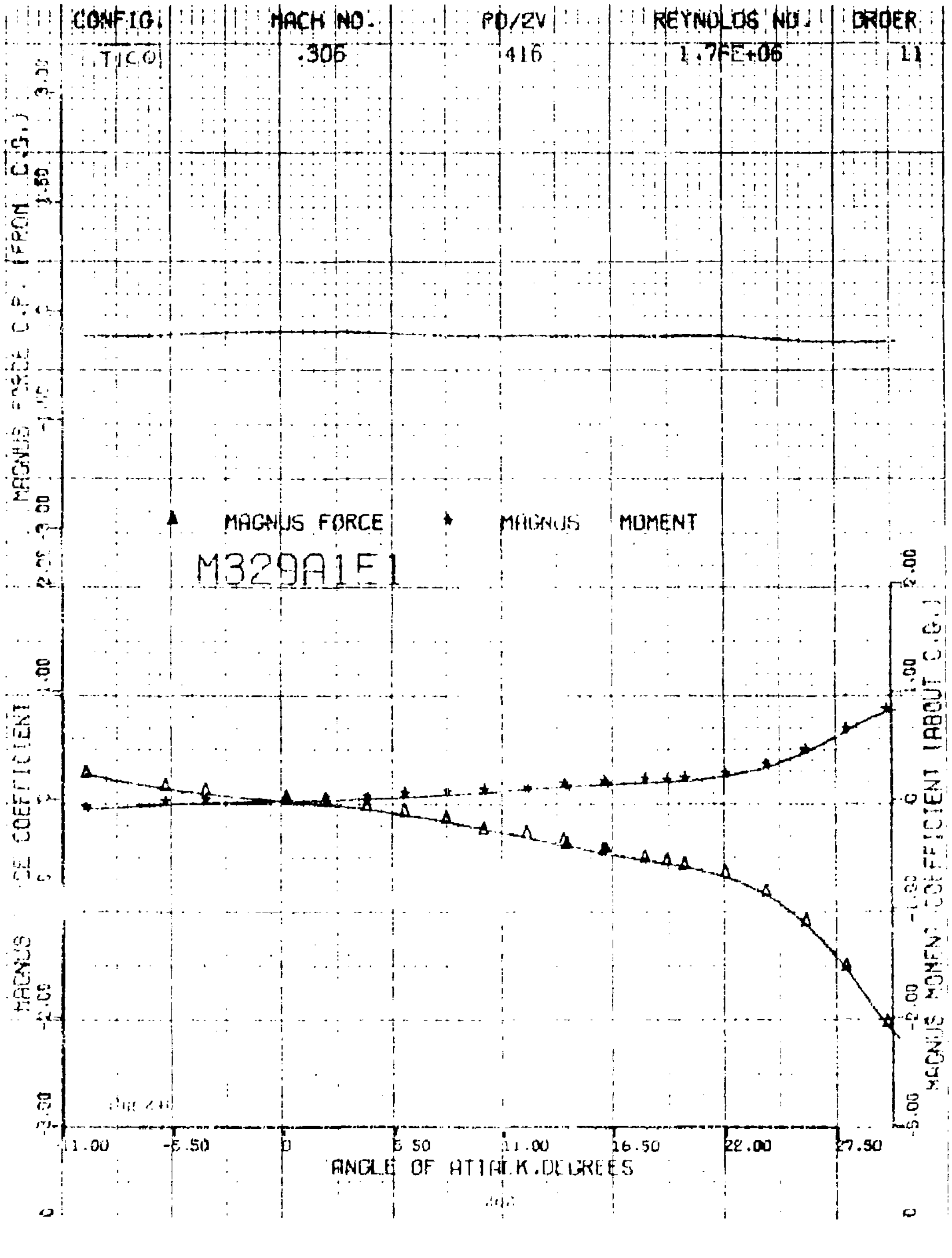
Fig 237

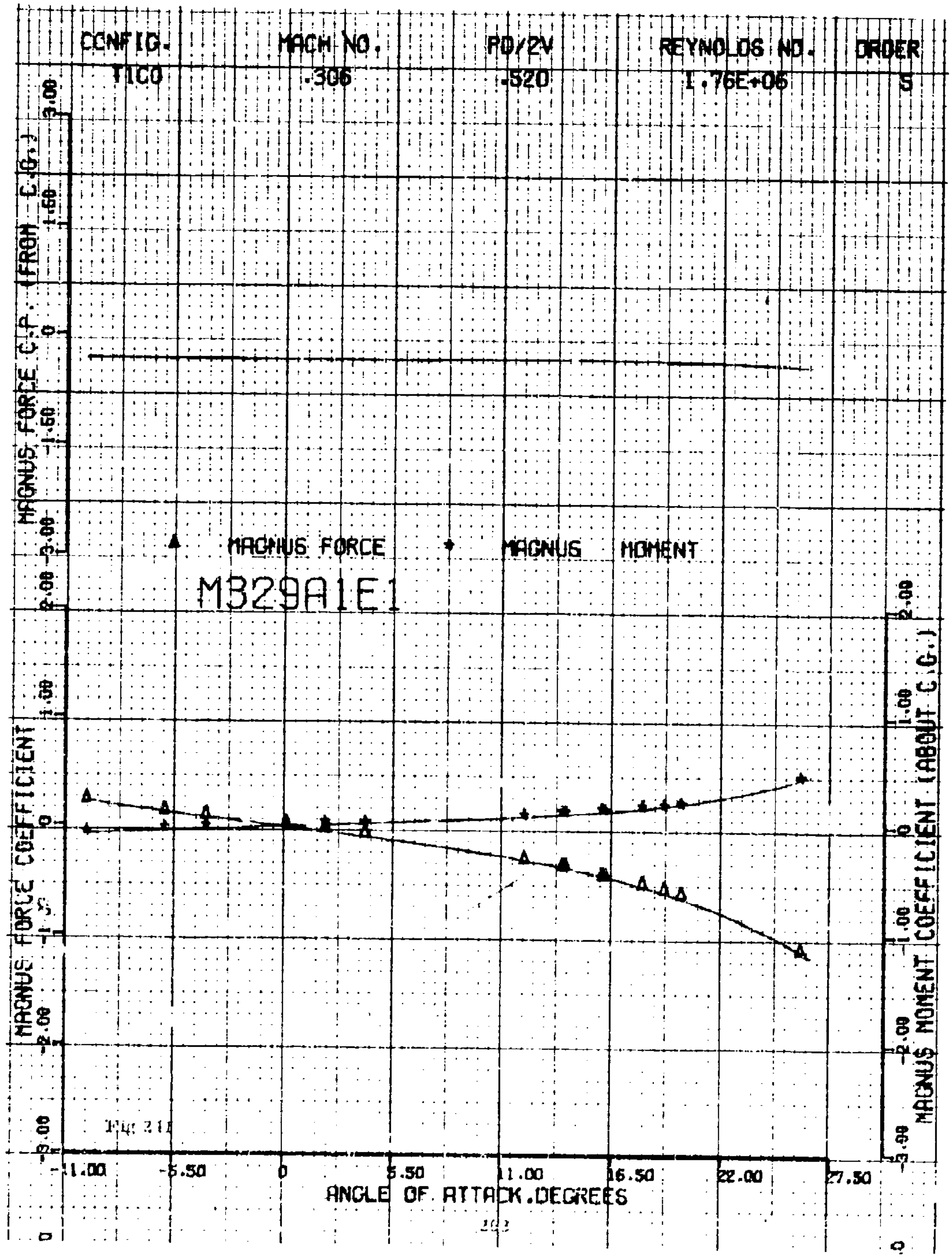


CONFIG.
TICQ
MACH NO.
.306
PD/2V
.208
REYNOLDS NO.
1.76E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
2.00
1.00
0
-1.00
-2.00
-3.00
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
ANGLE OF ATTACK, DEGREES

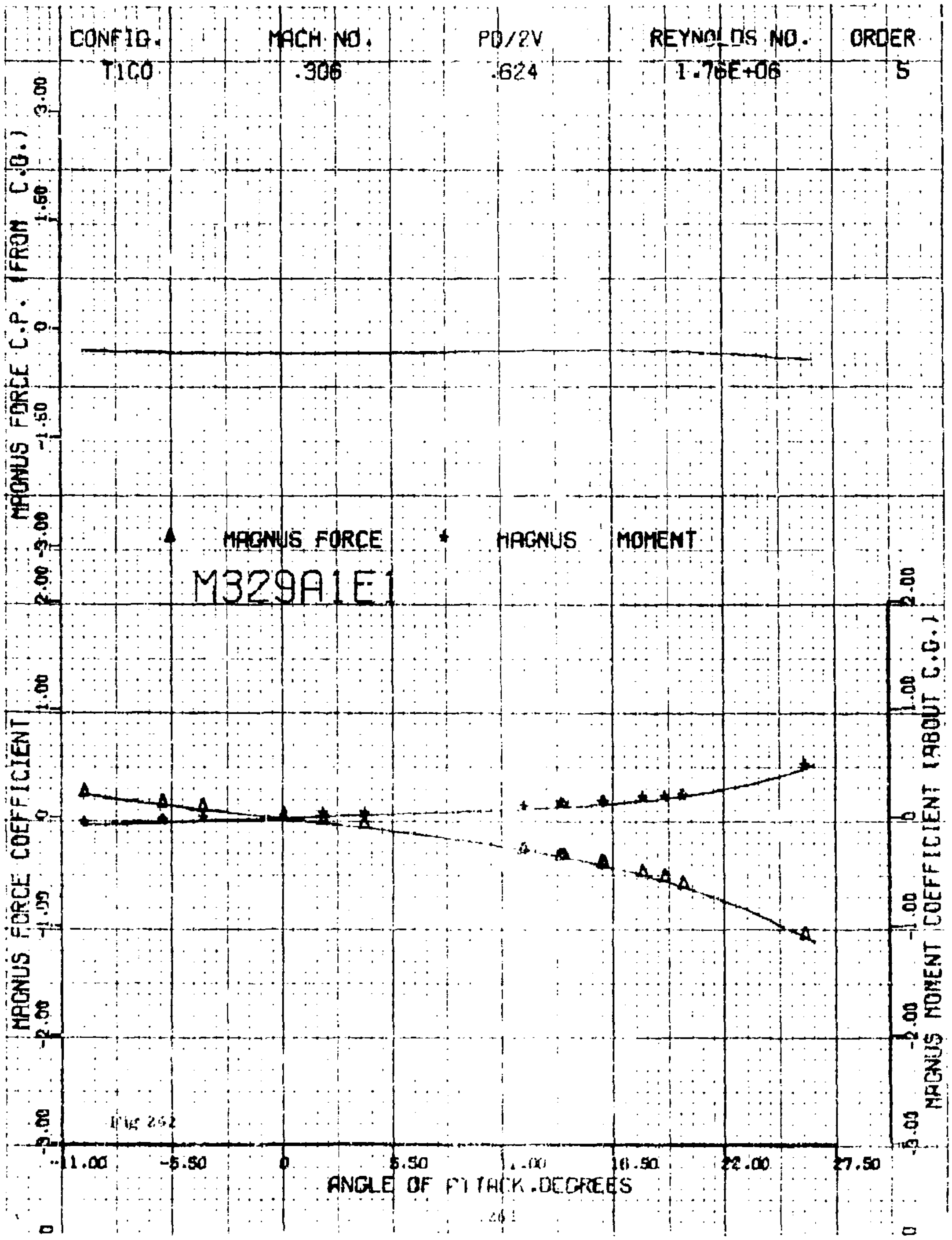
Fig. 238


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.306
.312
1.76E+06
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
fig 23P


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.306
416
1.7FE+06
11
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50



CONFIG. T1CO
MACH NO. .306
PD/2V .520
REYNOLDS NO. 1.76E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50
3.00
1.50
0
-1.50
-3.00
2.00
1.00
-1.00
-2.00
-3.00


CONFIG. T1C0
MACH NO. .306
PD/2V .624
REYNOLDS NO. 1.76E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

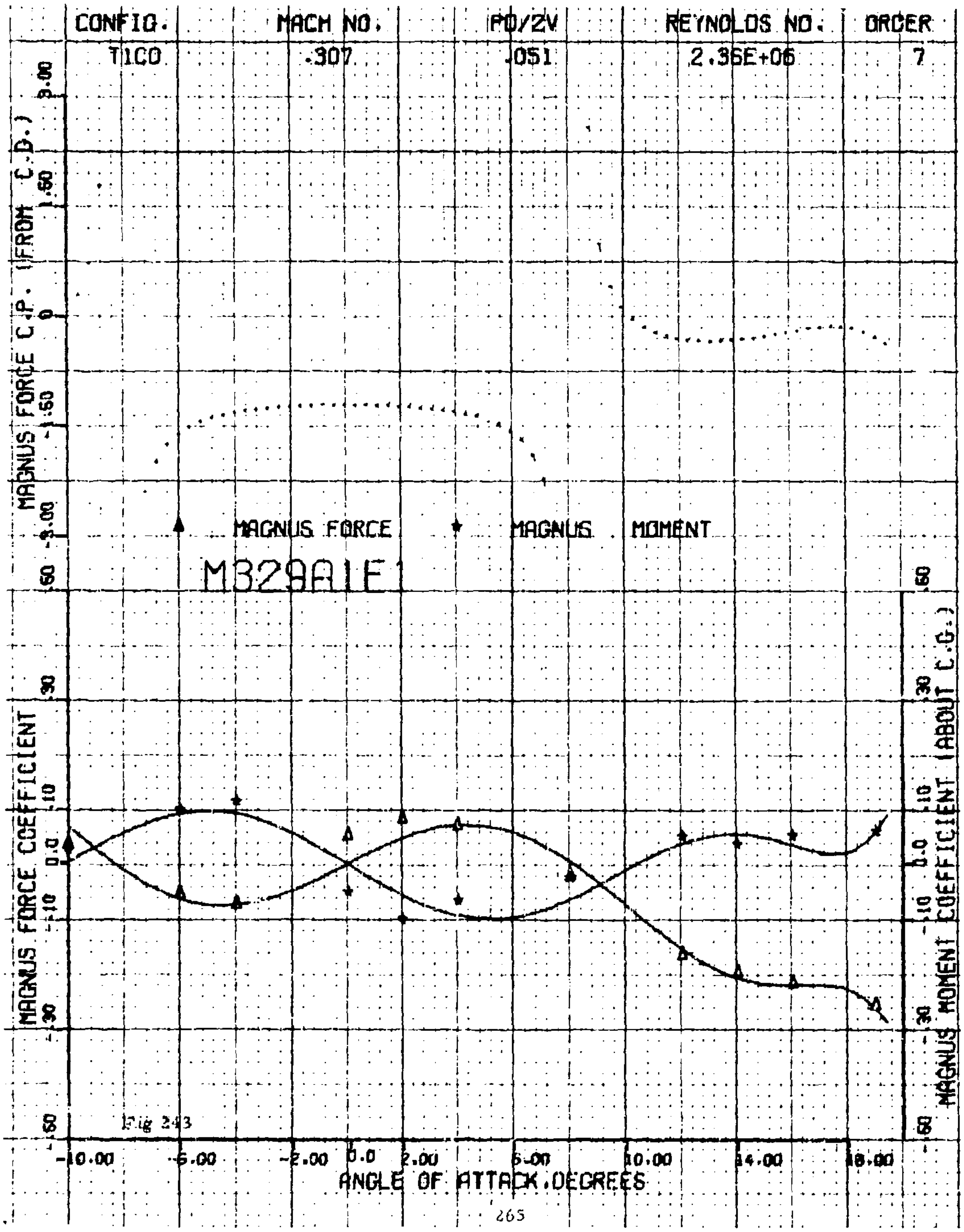
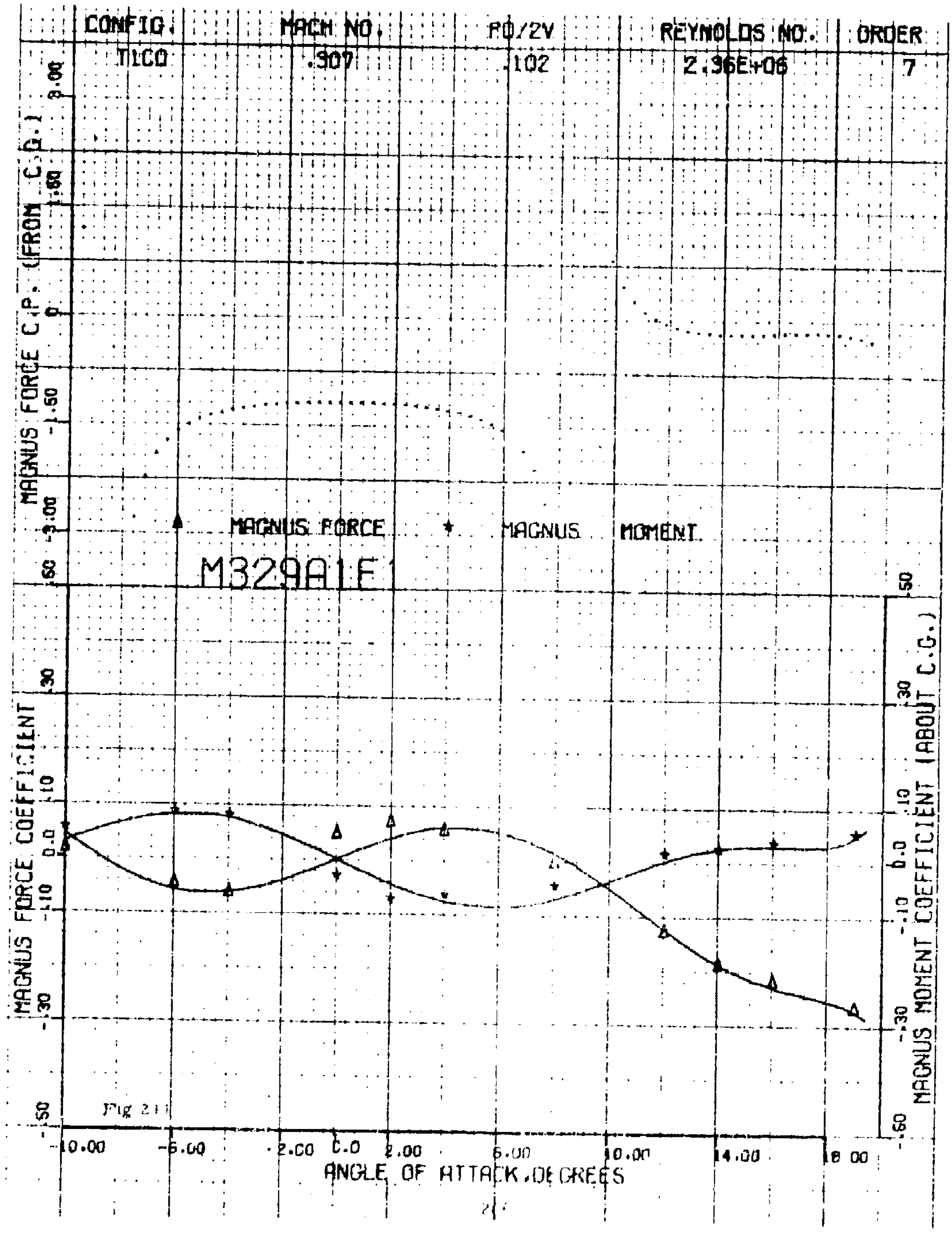

CONFIG.
T1CO
MACH NO.
.307
PD/2V
.051
REYNOLDS NO.
2.36E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

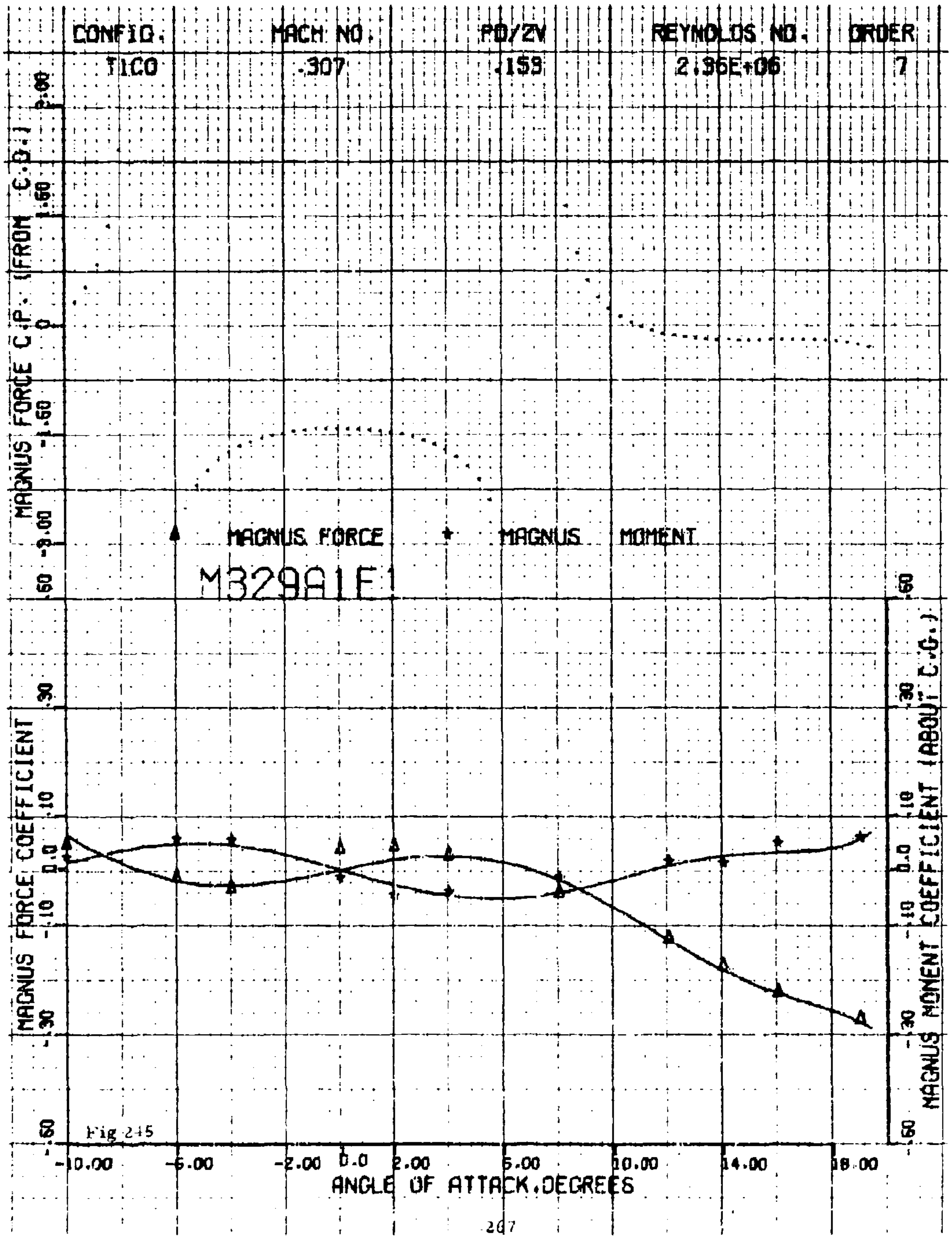
Fig 243



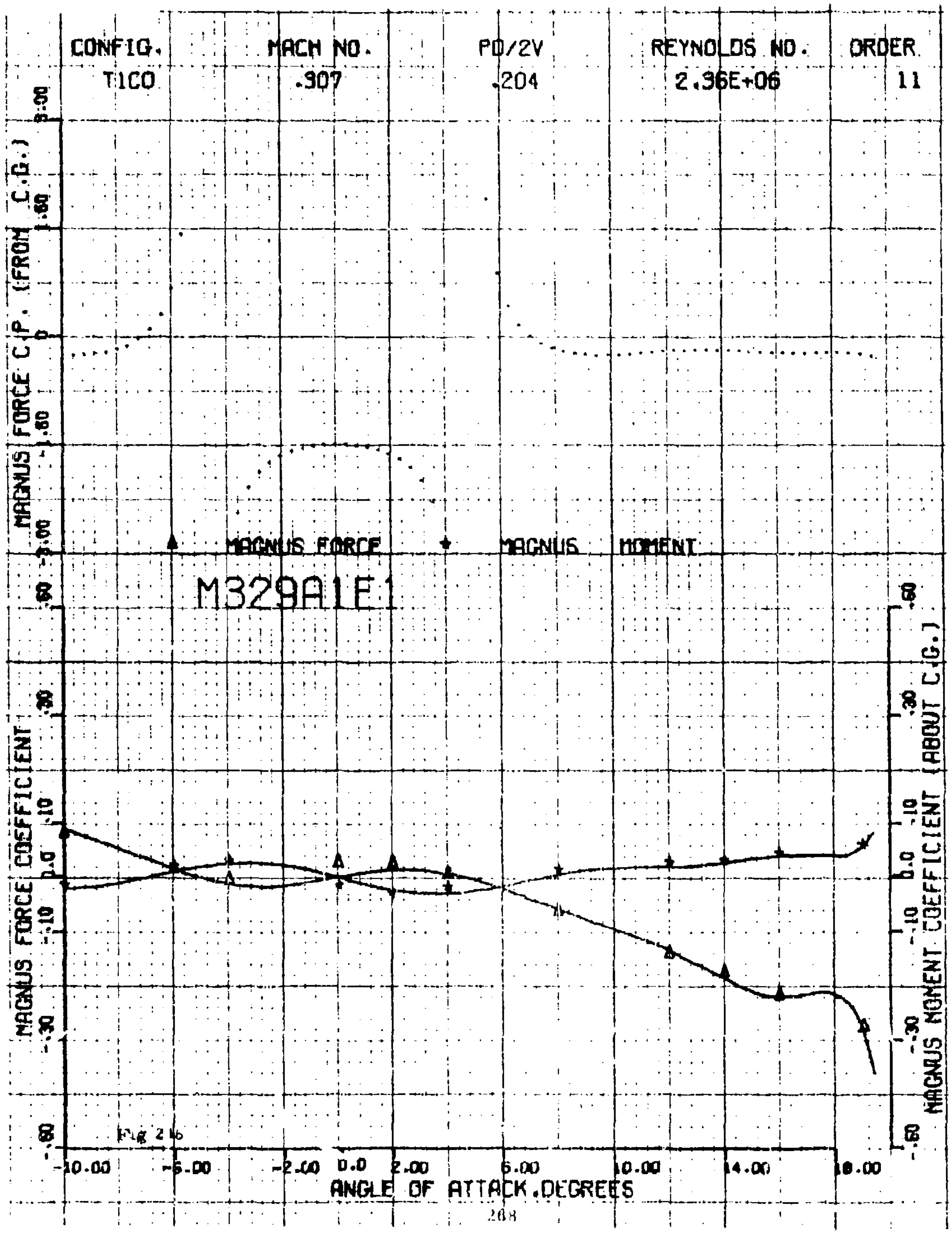
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.907
.102
2.36E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 2.11

217



CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1CO
.307
.159
2.36E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 245
ANGLE OF ATTACK,DEGREES


CONFIG. T1CO
MACH NO. .907
PD/2V .204
REYNOLDS NO. 2.36E+06
ORDER 11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 2 b

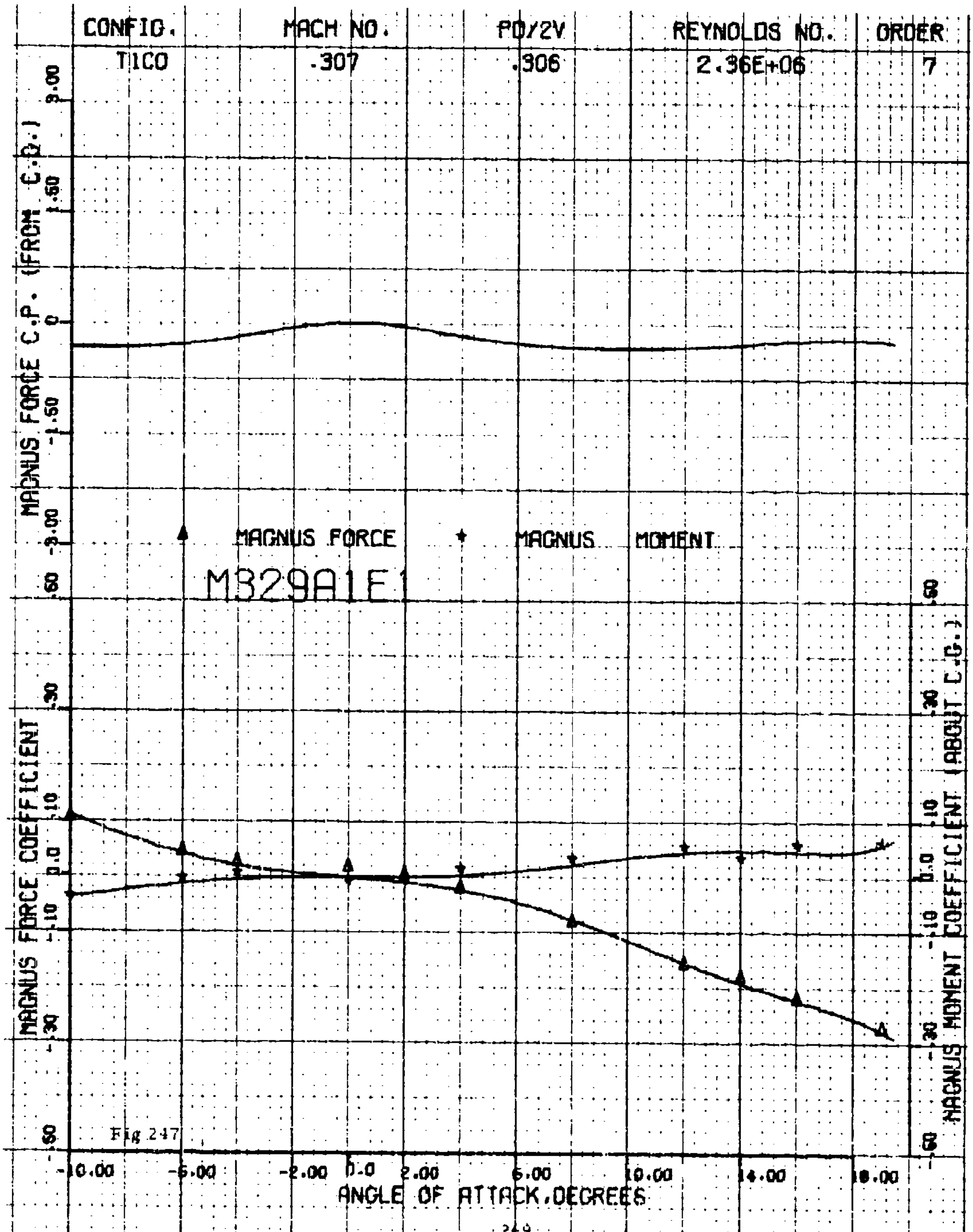
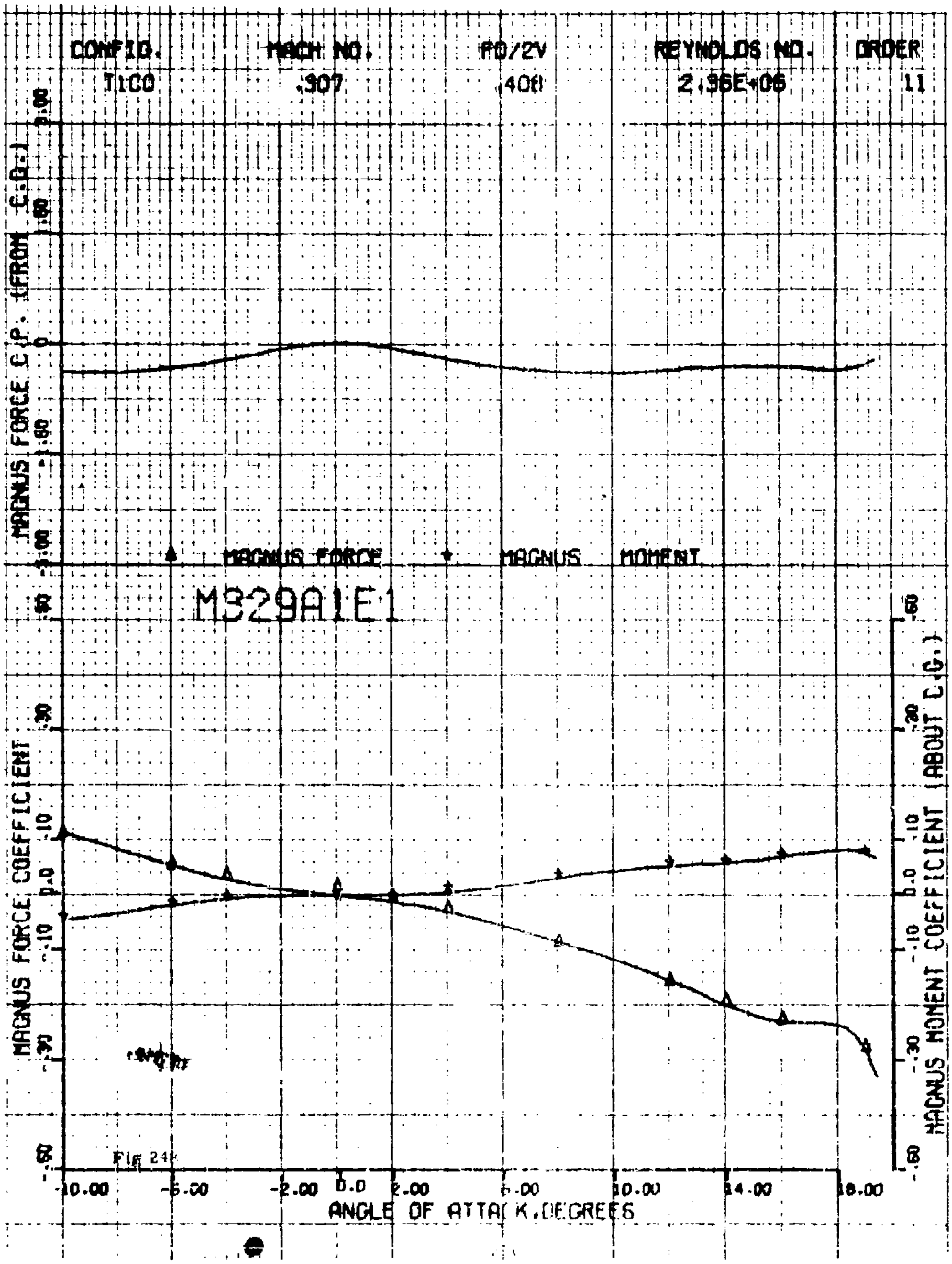
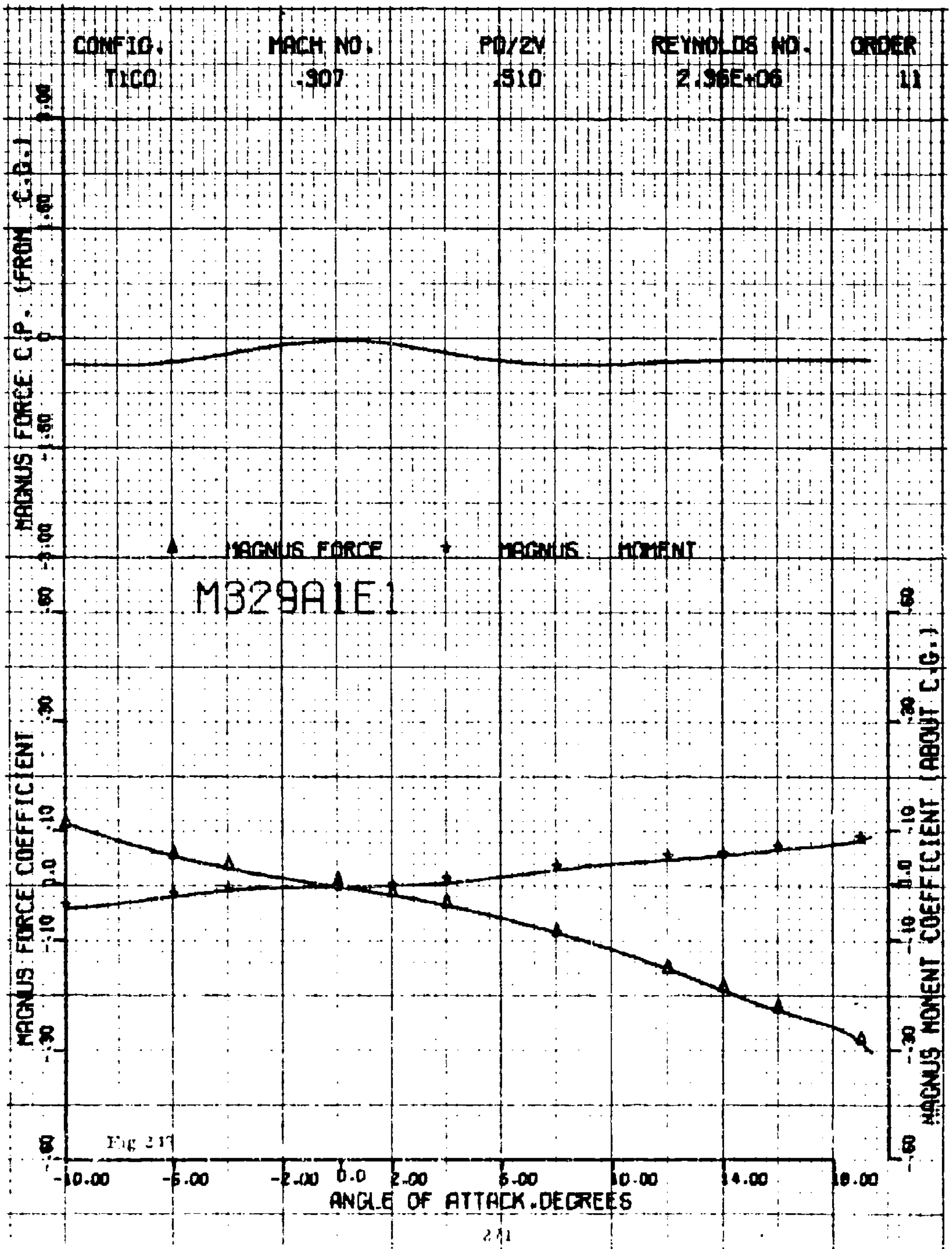

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.307
.306
2.36E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 247



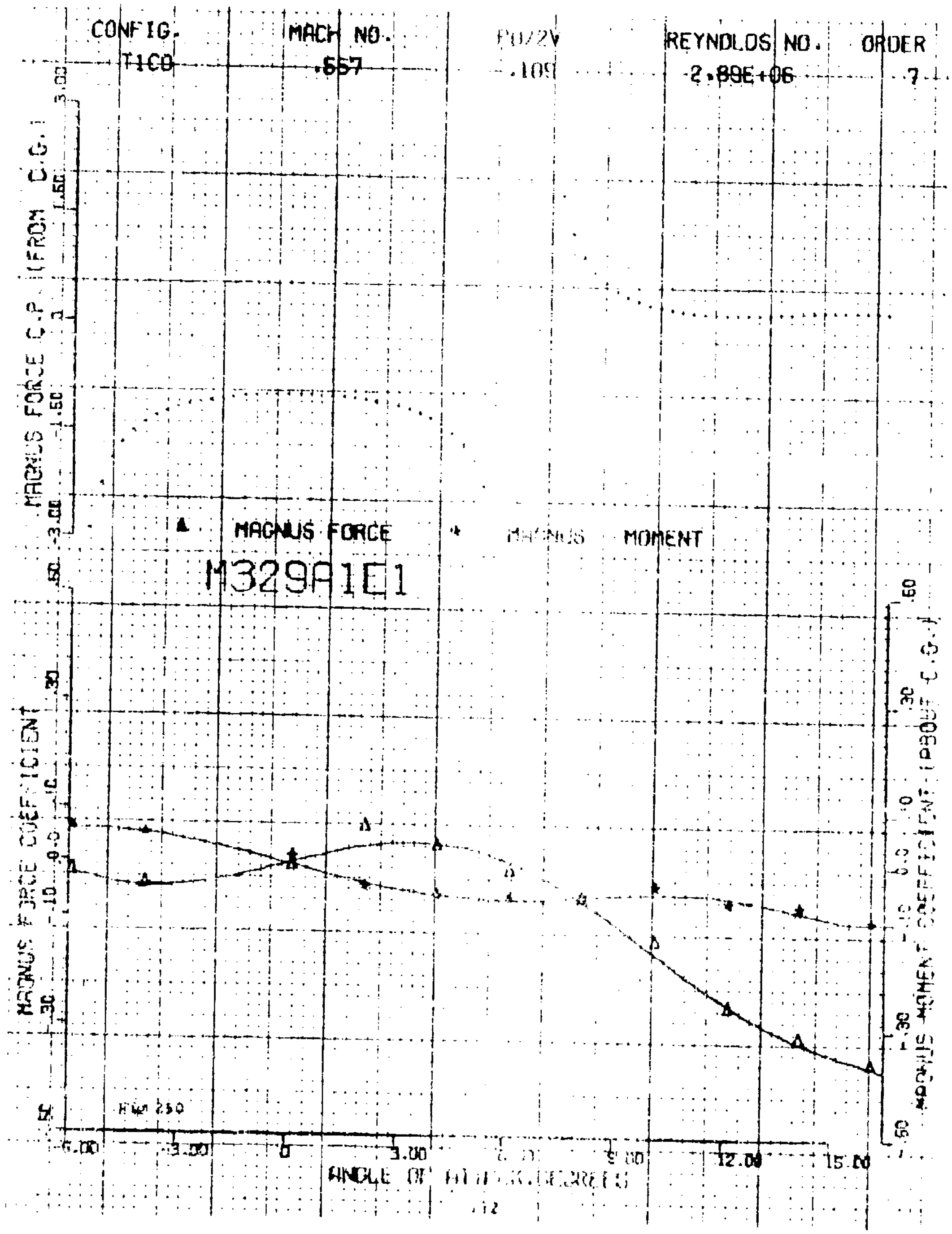
CONFIG.
T1C0
MACH NO.
.307
PD/2V
.400
REYNOLDS NO.
2.36E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00

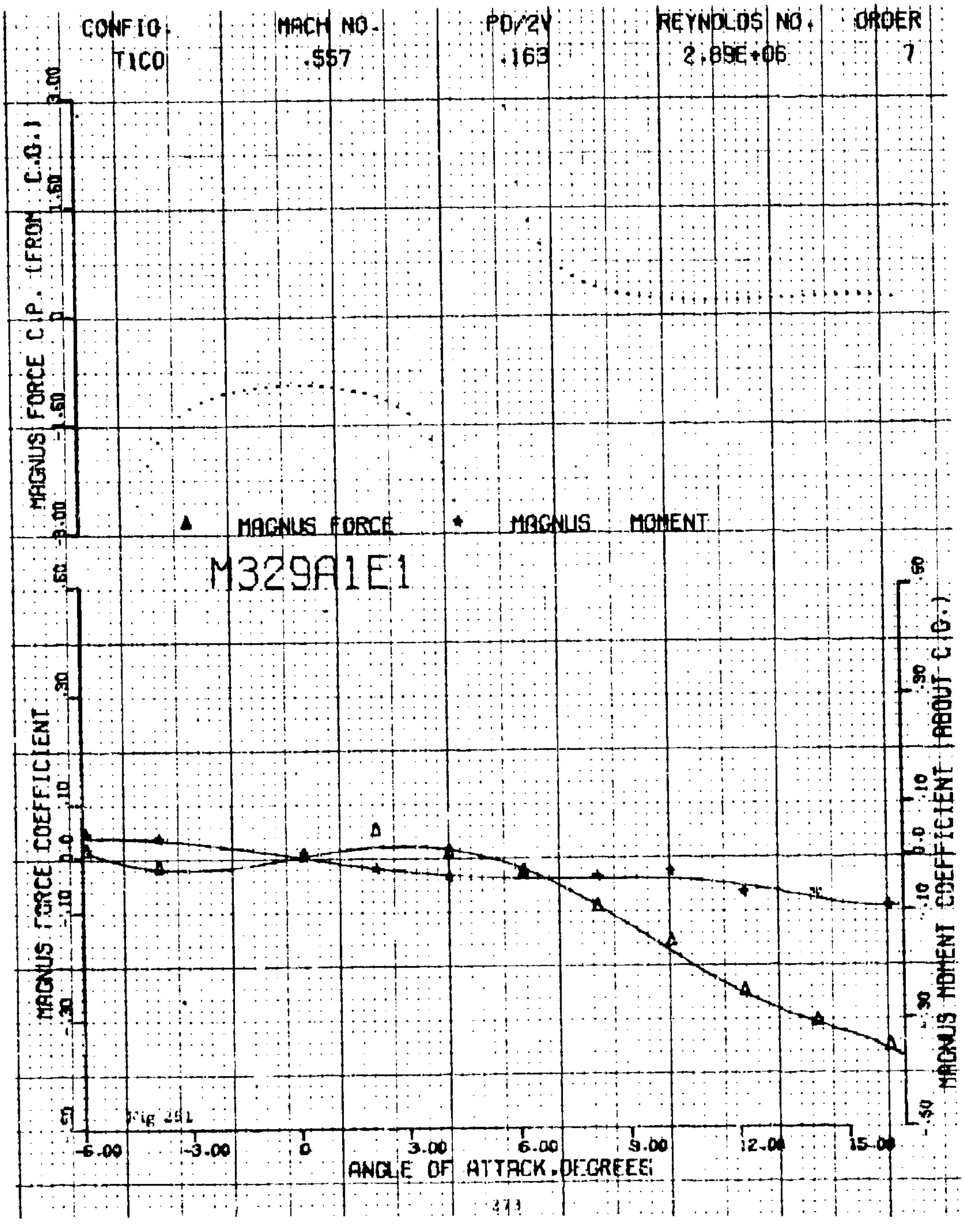
Fig 24



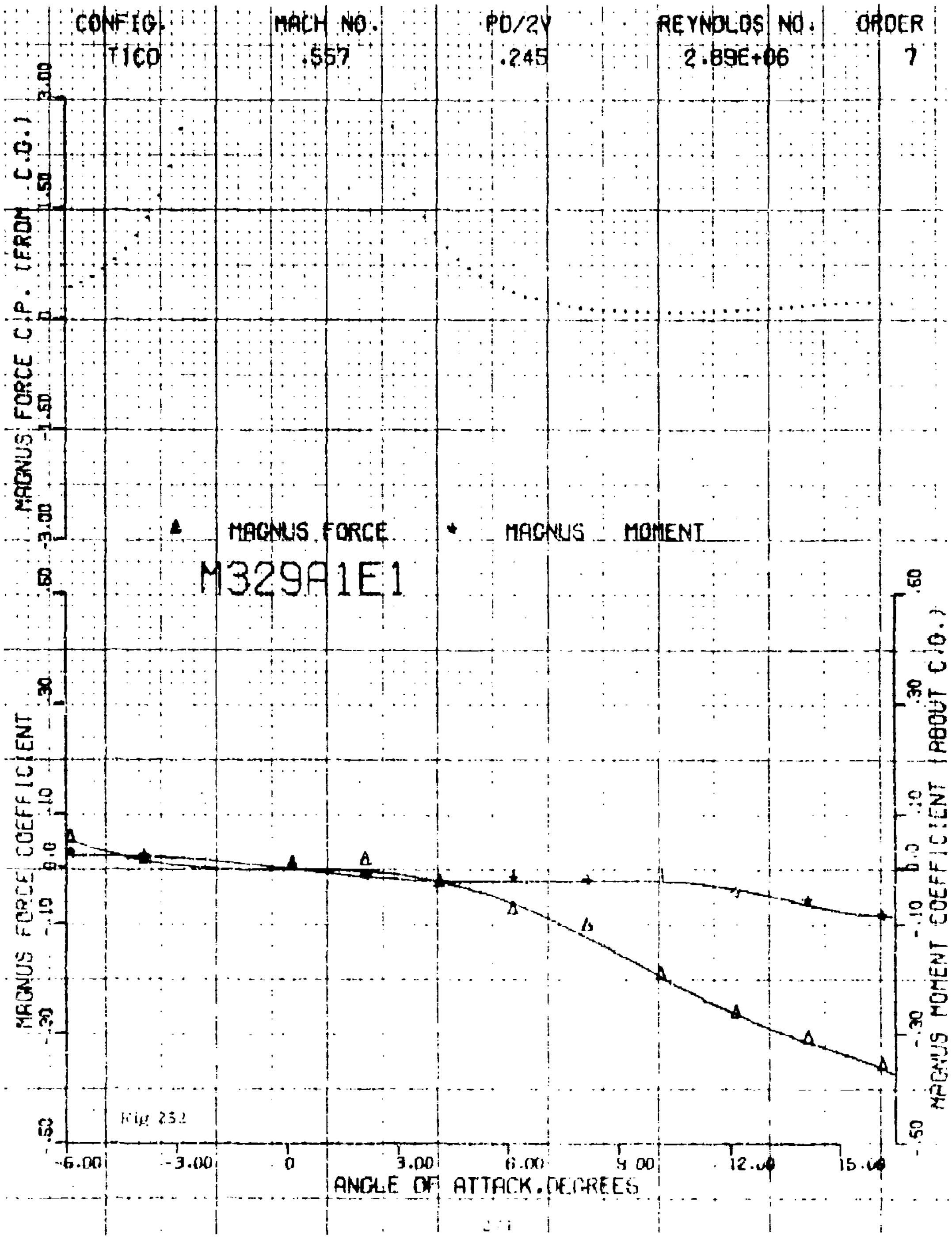
CONFIG.
TICO
MACH NO.
.307
PD/2V
.510
REYNOLDS NO.
2.36E+06
ORDER
11
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 217


CONFIG. T1C0
MACH NO. .557
ROLL RATE (shown as POZZV) .109
REYNOLDS NO. 2.89E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
▲ MAGNUS FORCE
* MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES



CONFIG TICO
MACH NO. .557
PD/2V .163
REYNOLDS NO. 2.89E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 251



CONFIG.
TICO
MACH NO.
.557
PD/2V
.245
REYNOLDS NO.
2.89E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.60
.30
.10
0.0
-.10
-.30
-.50
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK, DEGREES
Fig 232

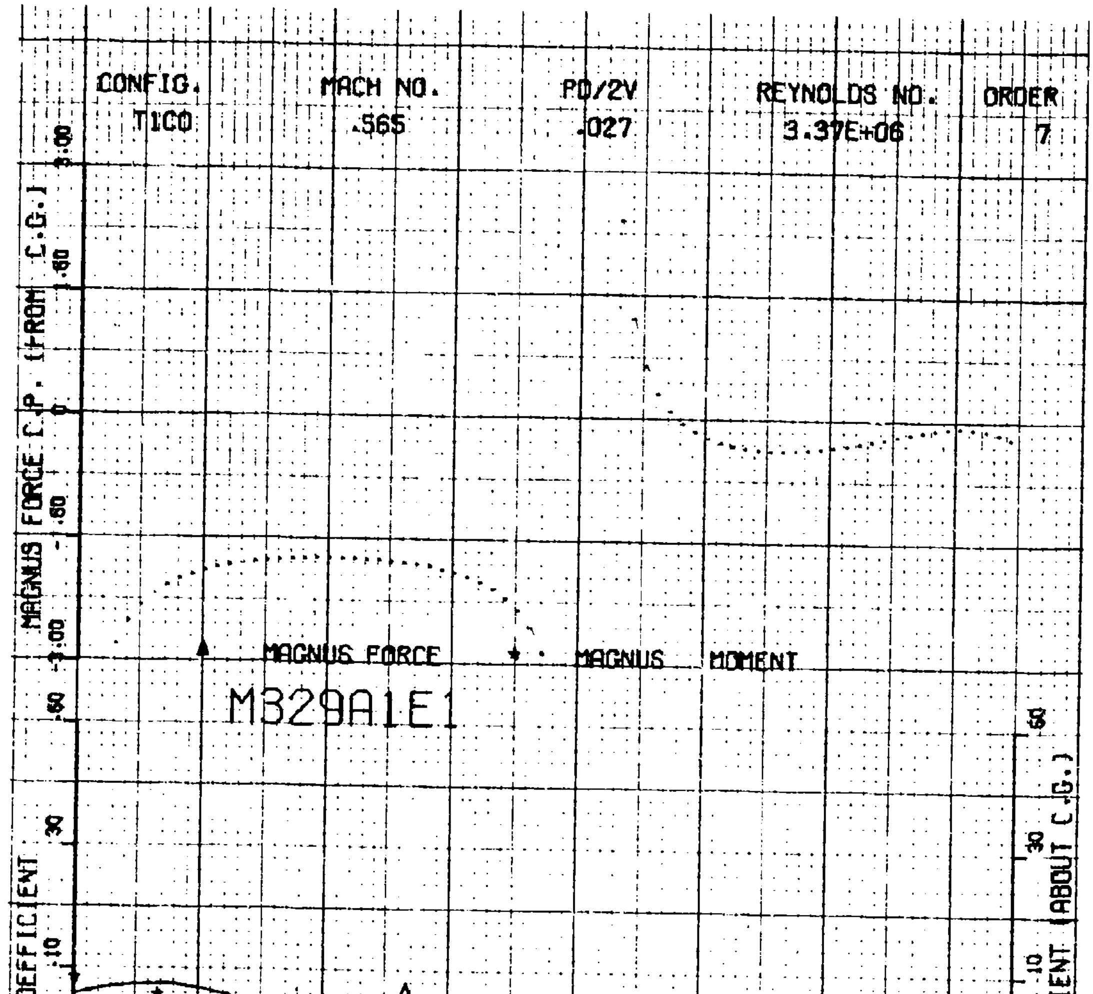
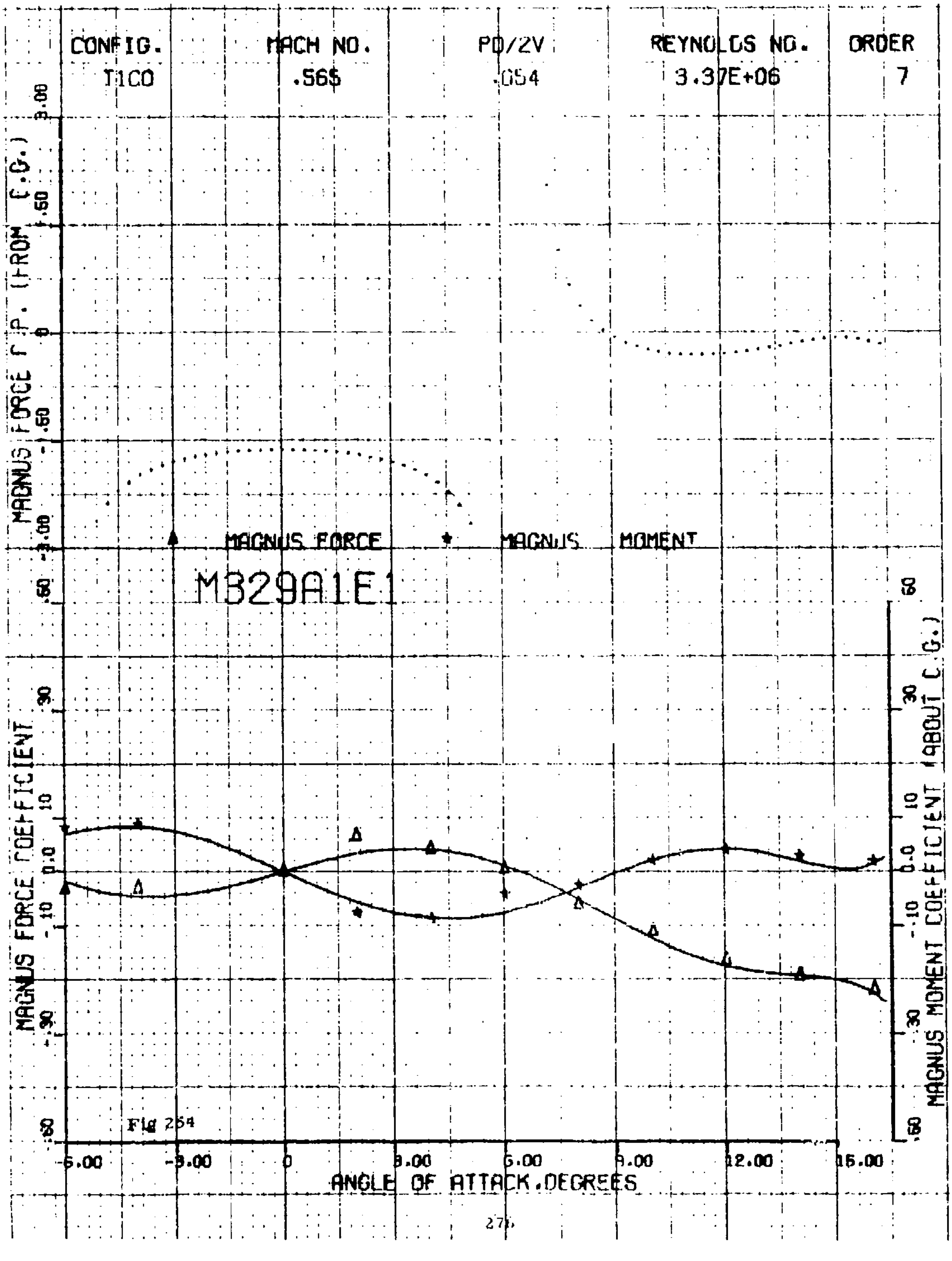

CONFIG.
T1C0
MACH NO.
.565
PD/2V
.027
REYNOLDS NO.
3.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 253


CONFIG.
T1CO
MACH NO.
.56$
PD/2V
.054
REYNOLDS NO.
3.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
Fig 264

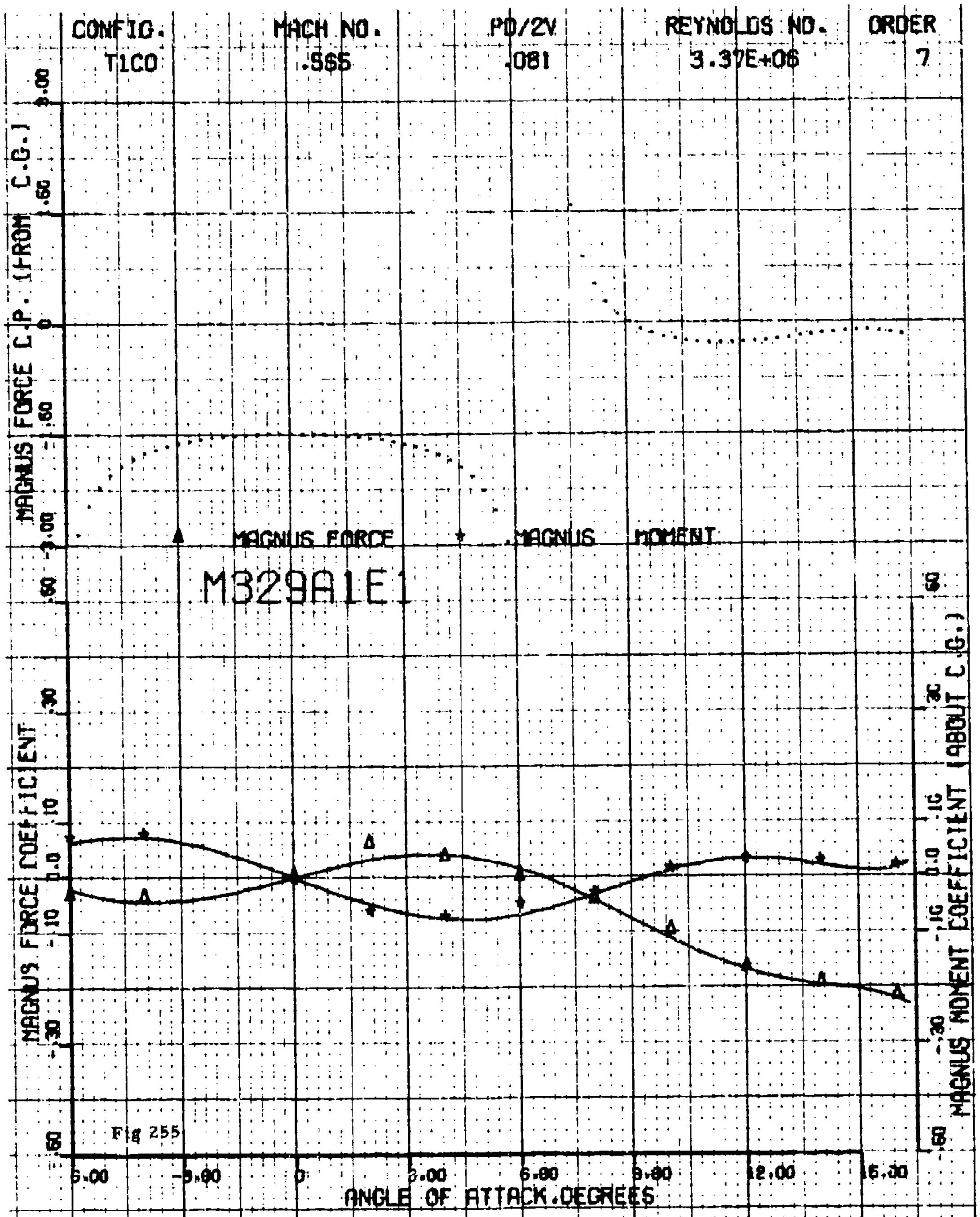
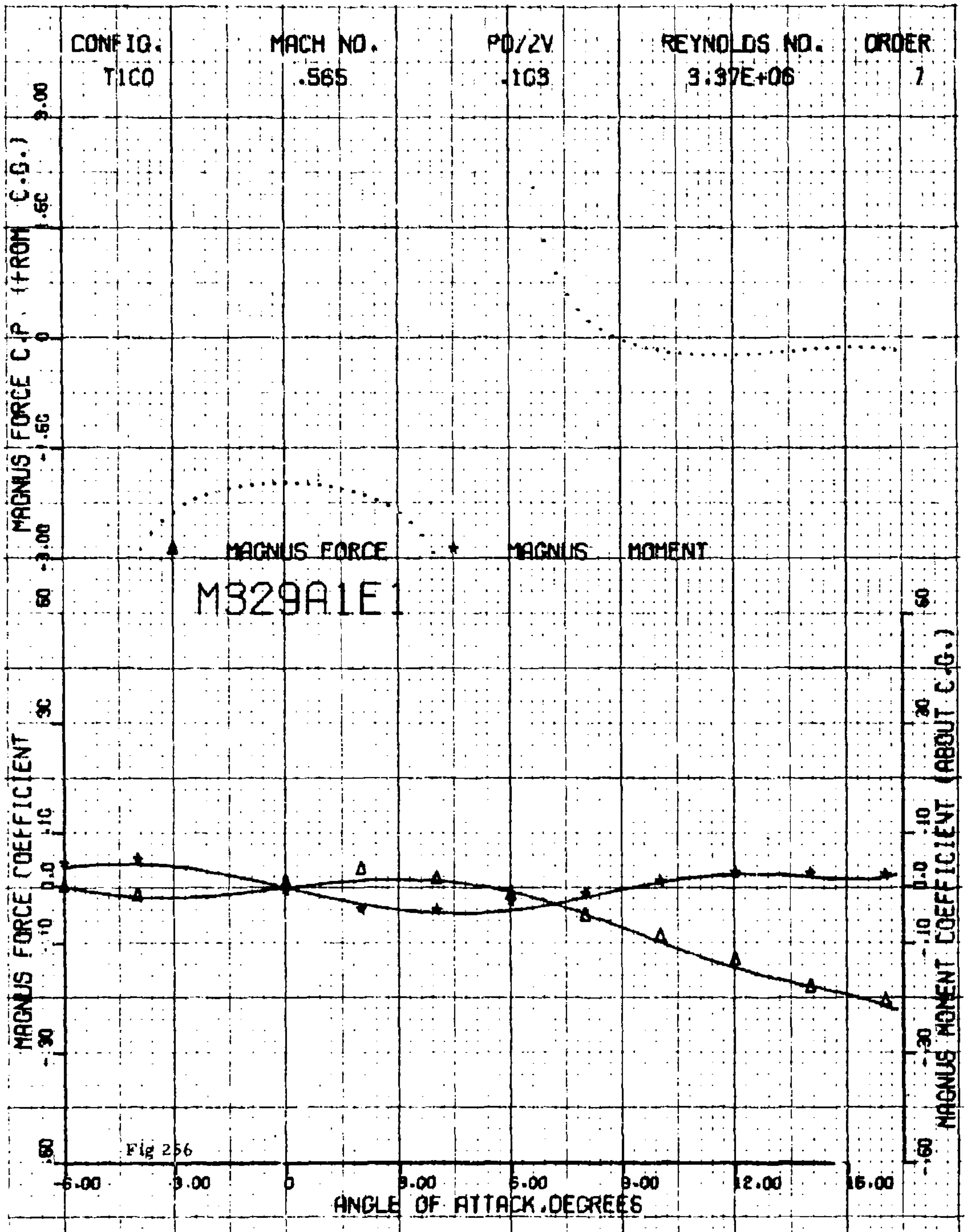

CONFIG.
T1CO
MACH NO.
.565
PD/2V
.081
REYNOLDS NO.
3.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 255



CONFIG. T1CO
MACH NO. .565
PD/2V .103
REYNOLDS NO. 3.37E+06
ORDER 1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 256

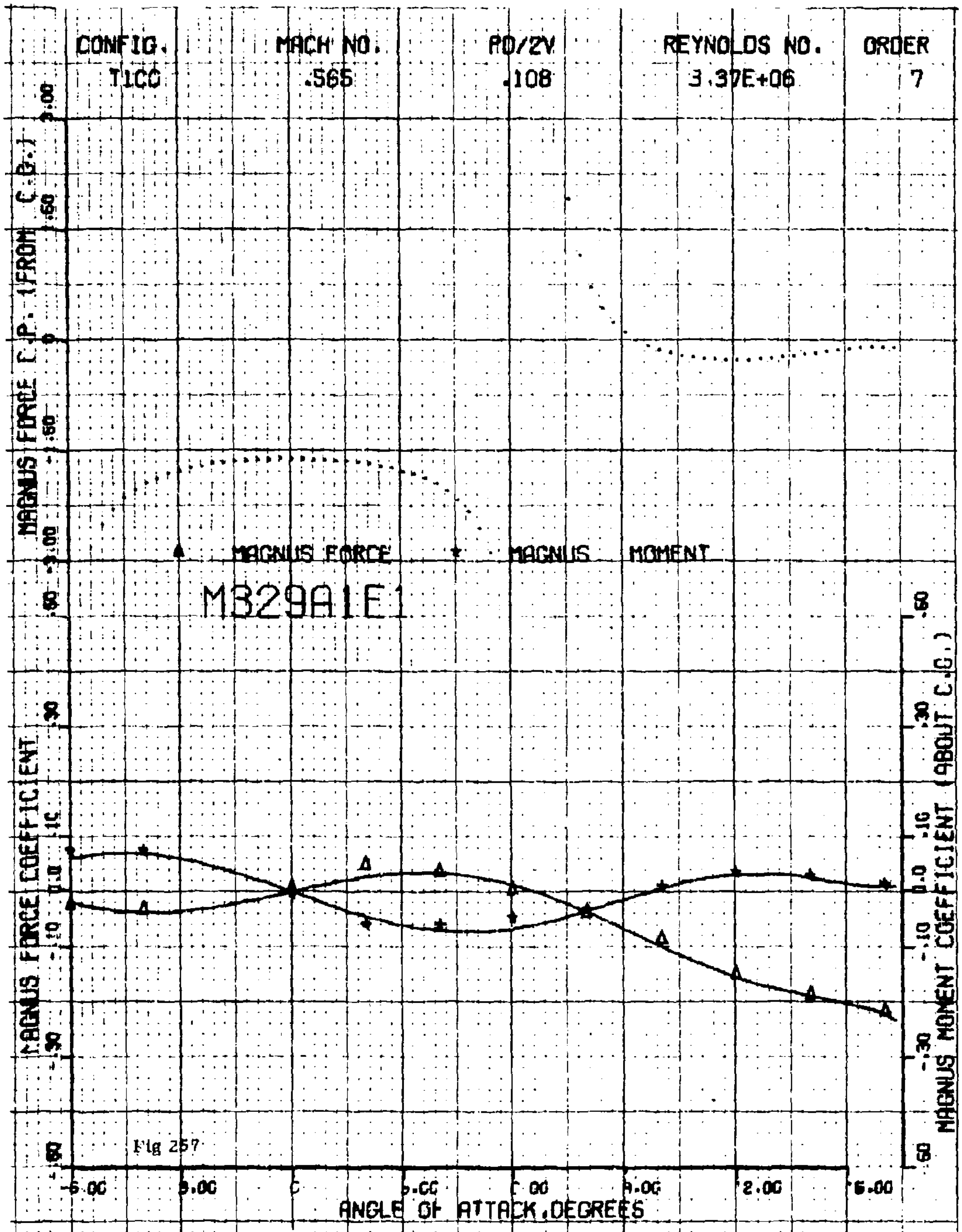
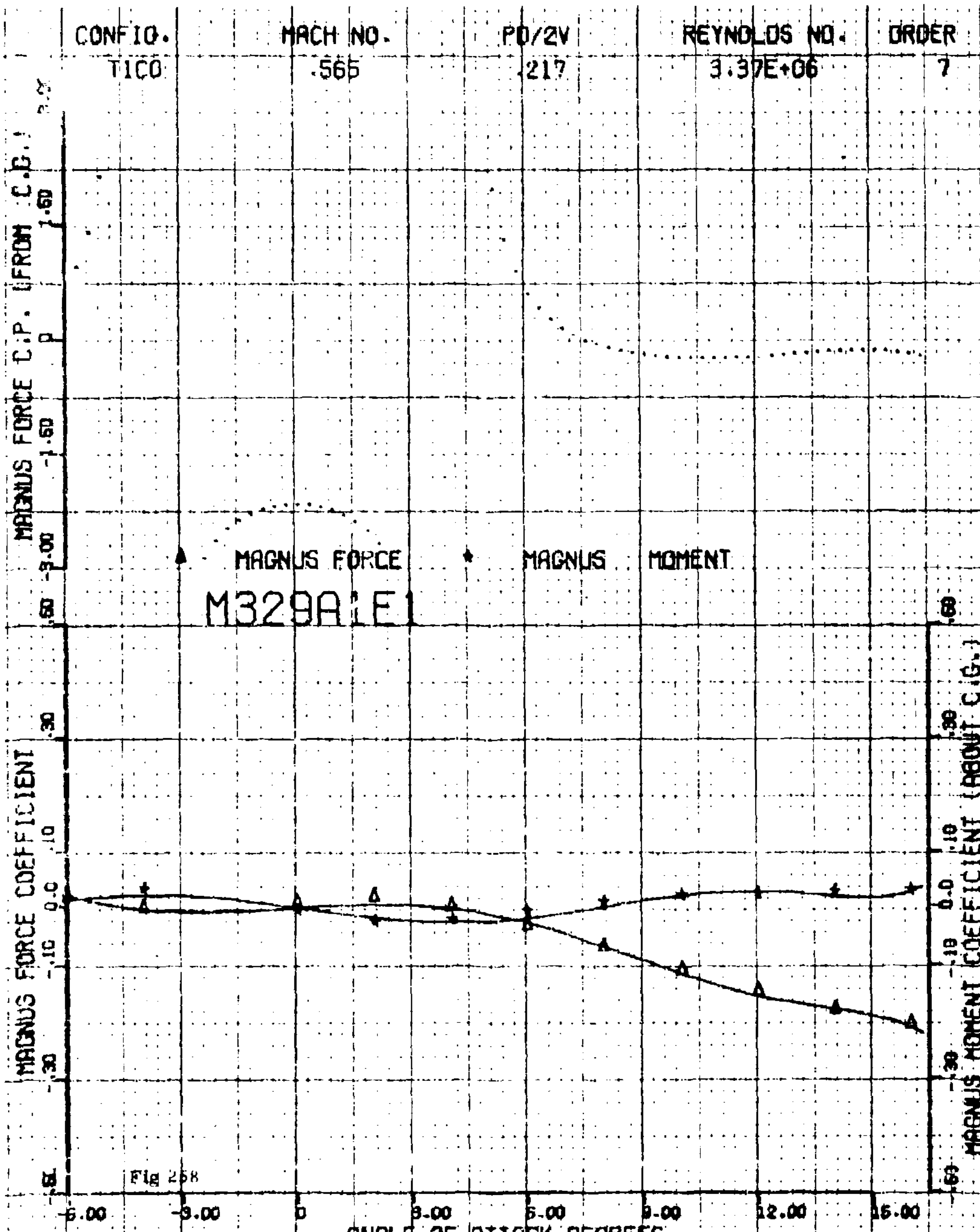
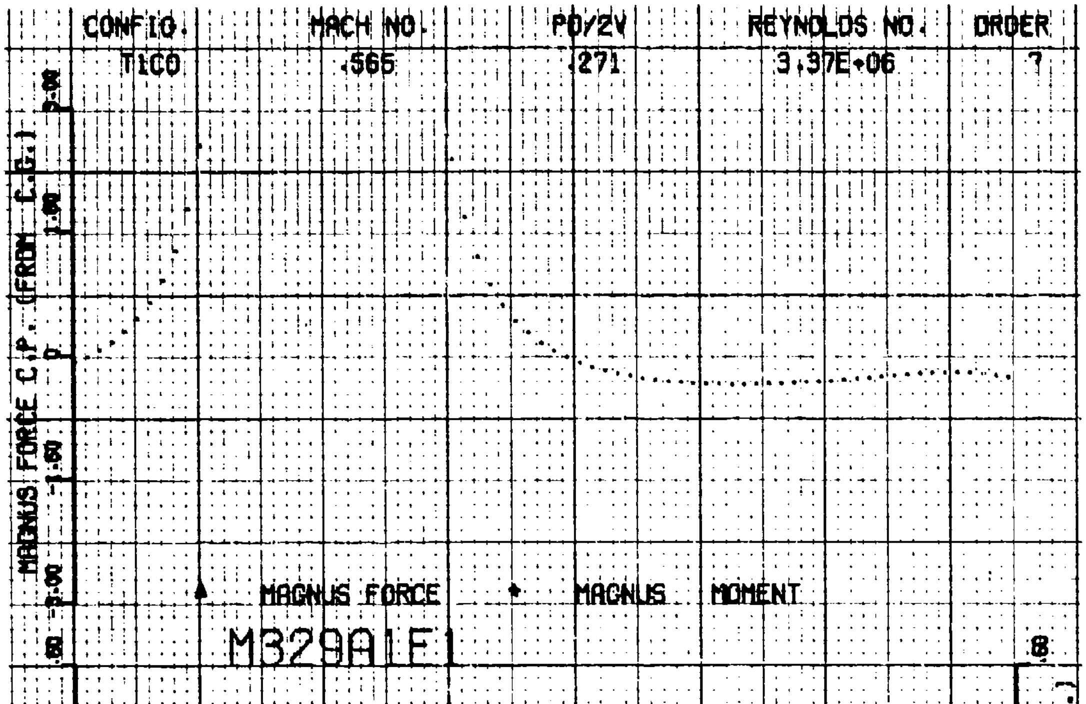

CONFIG.
T1CC
MACH NO.
.565
PD/2V
.108
REYNOLDS NO.
3.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

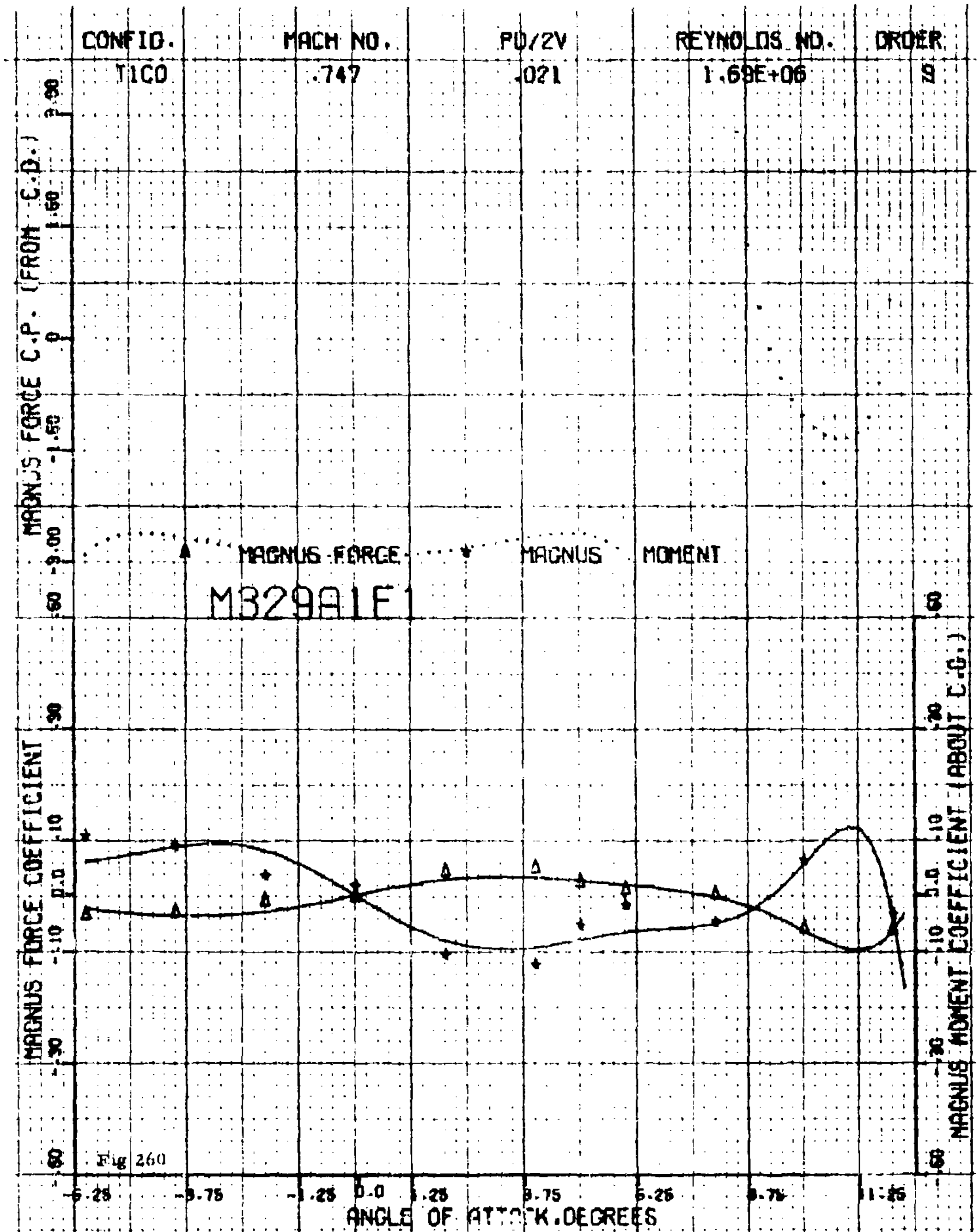
Fig 257

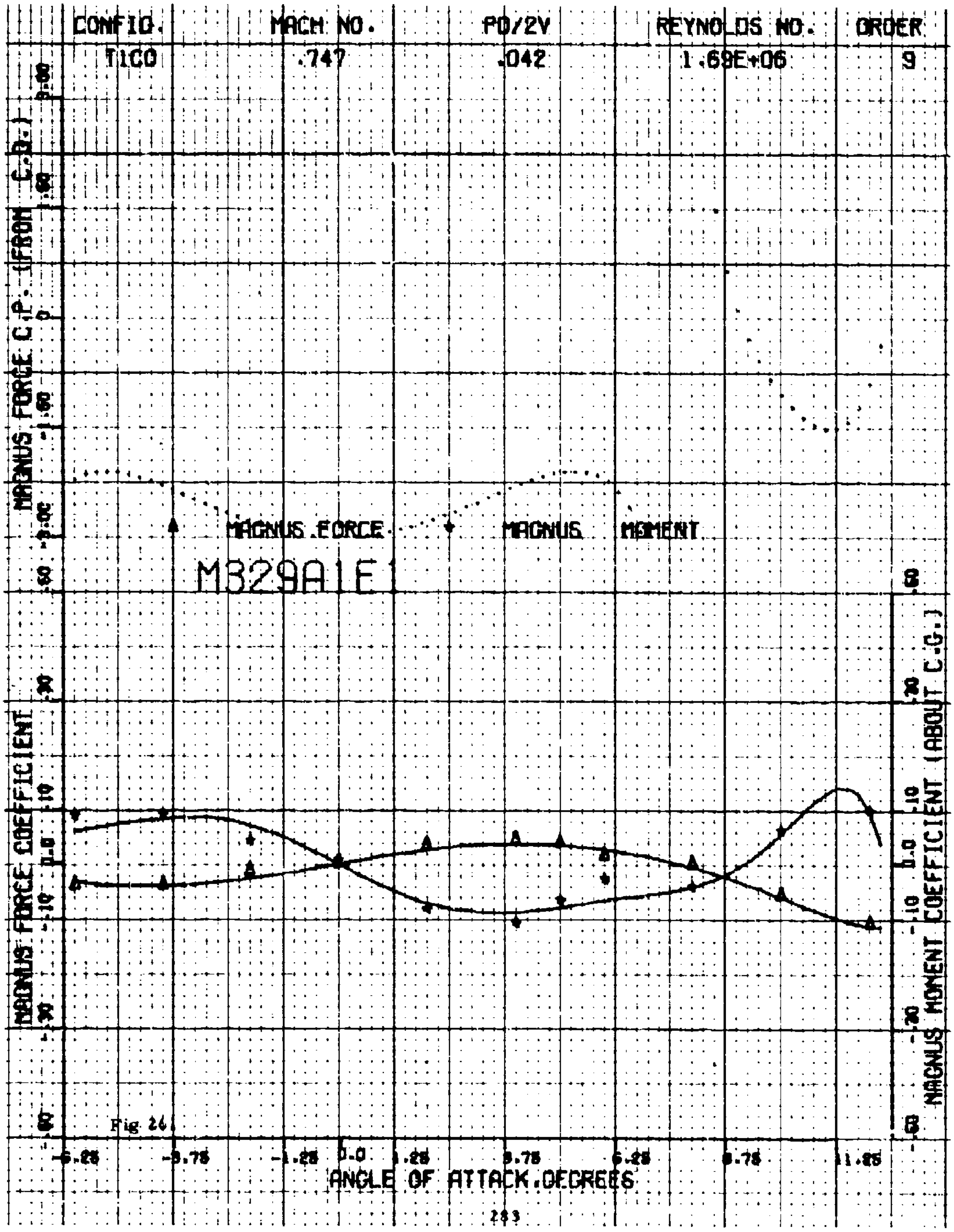


CONFIG. TICO
MACH NO. .565
PD/2V .217
REYNOLDS NO. 3.37E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 258

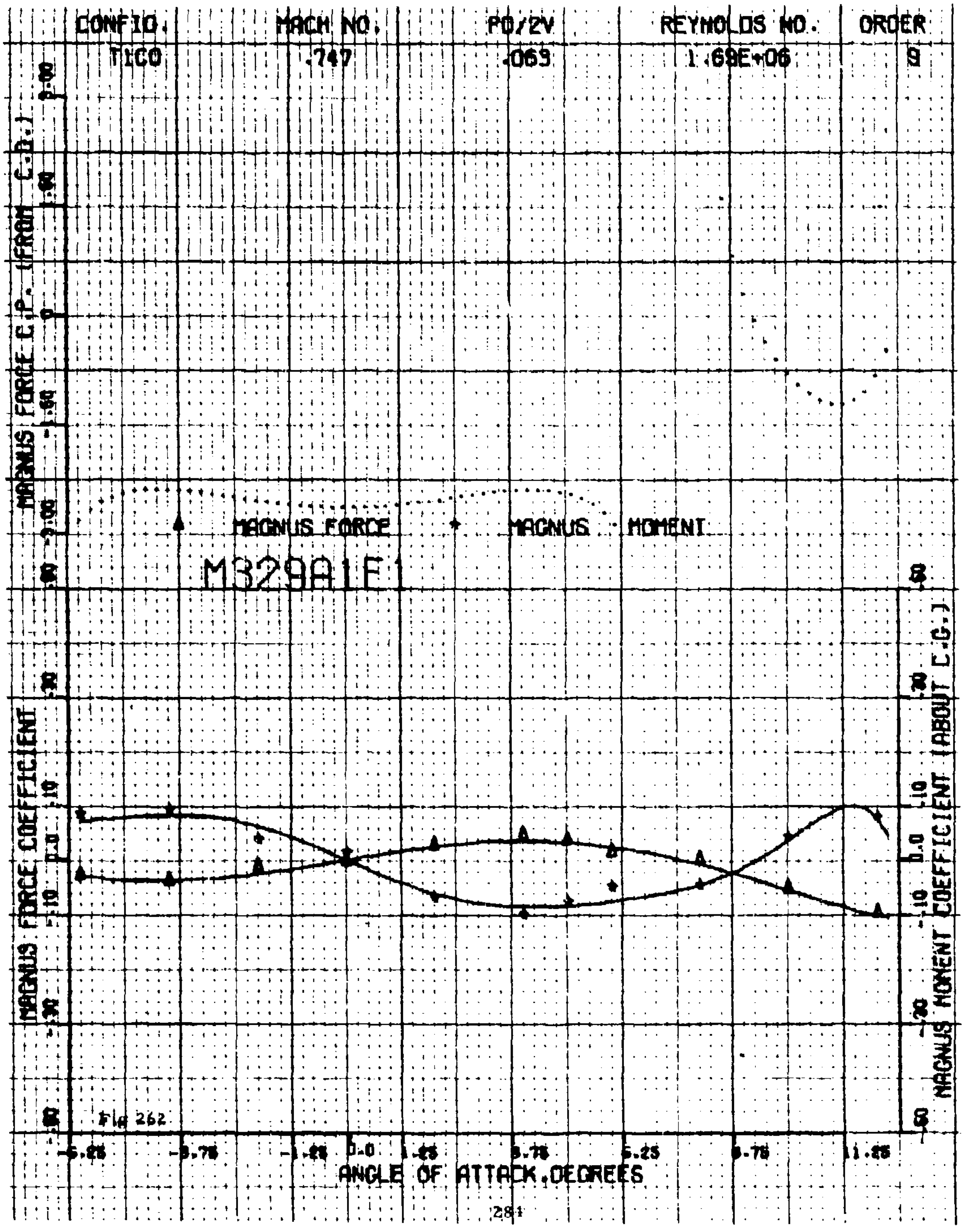

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C0
.565
.271
3.37E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 259


CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
TICO .747 .021 1.69E+06 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE ★ MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.25 -3.75 -1.25 0.0 1.25 3.75 6.25 8.75 11.25
Fig 260

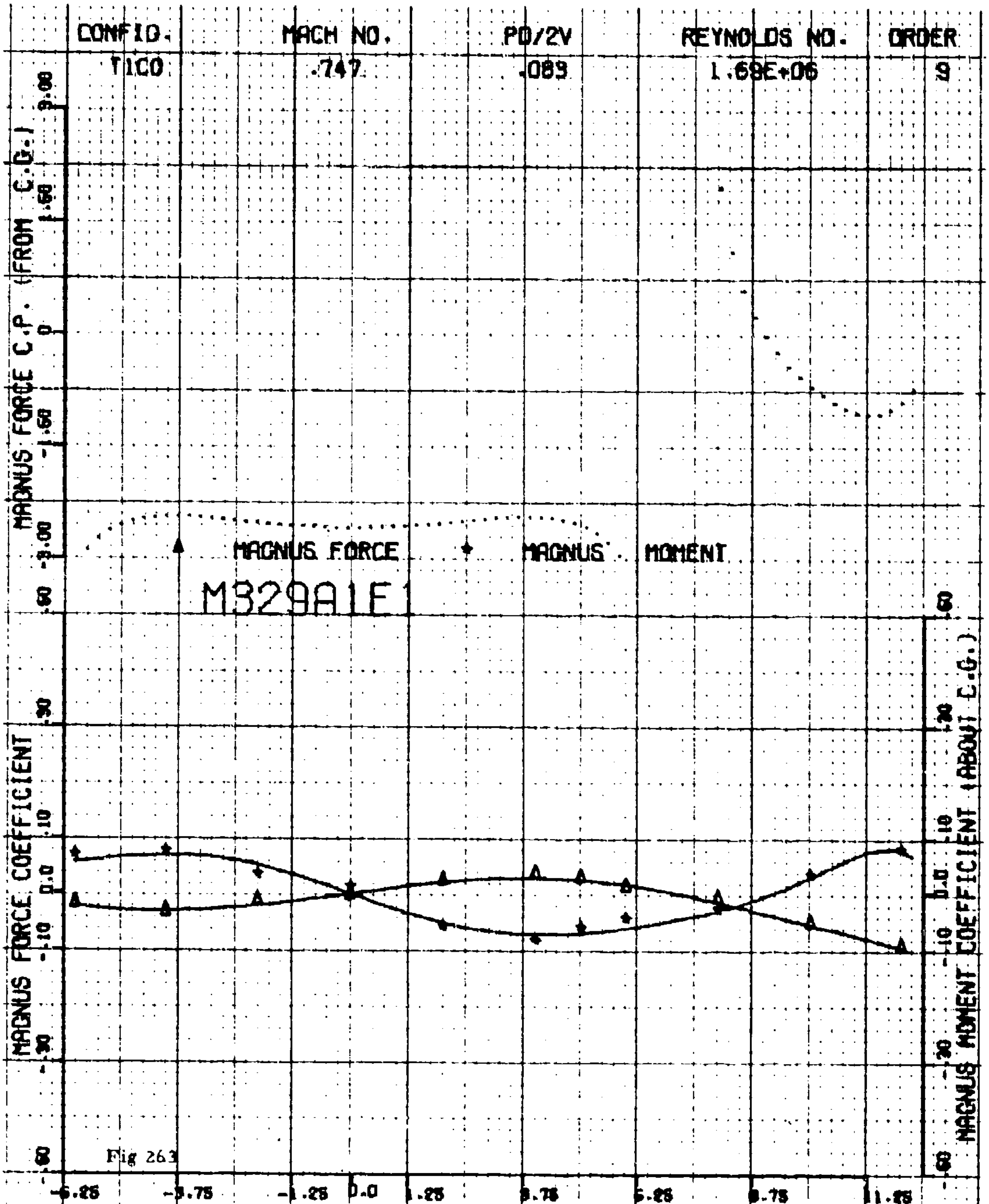


CONFIG.
T1C0
MACH NO.
.747
PD/2V
.042
REYNOLDS NO.
1.69E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK,DEGREES

Fig. 26

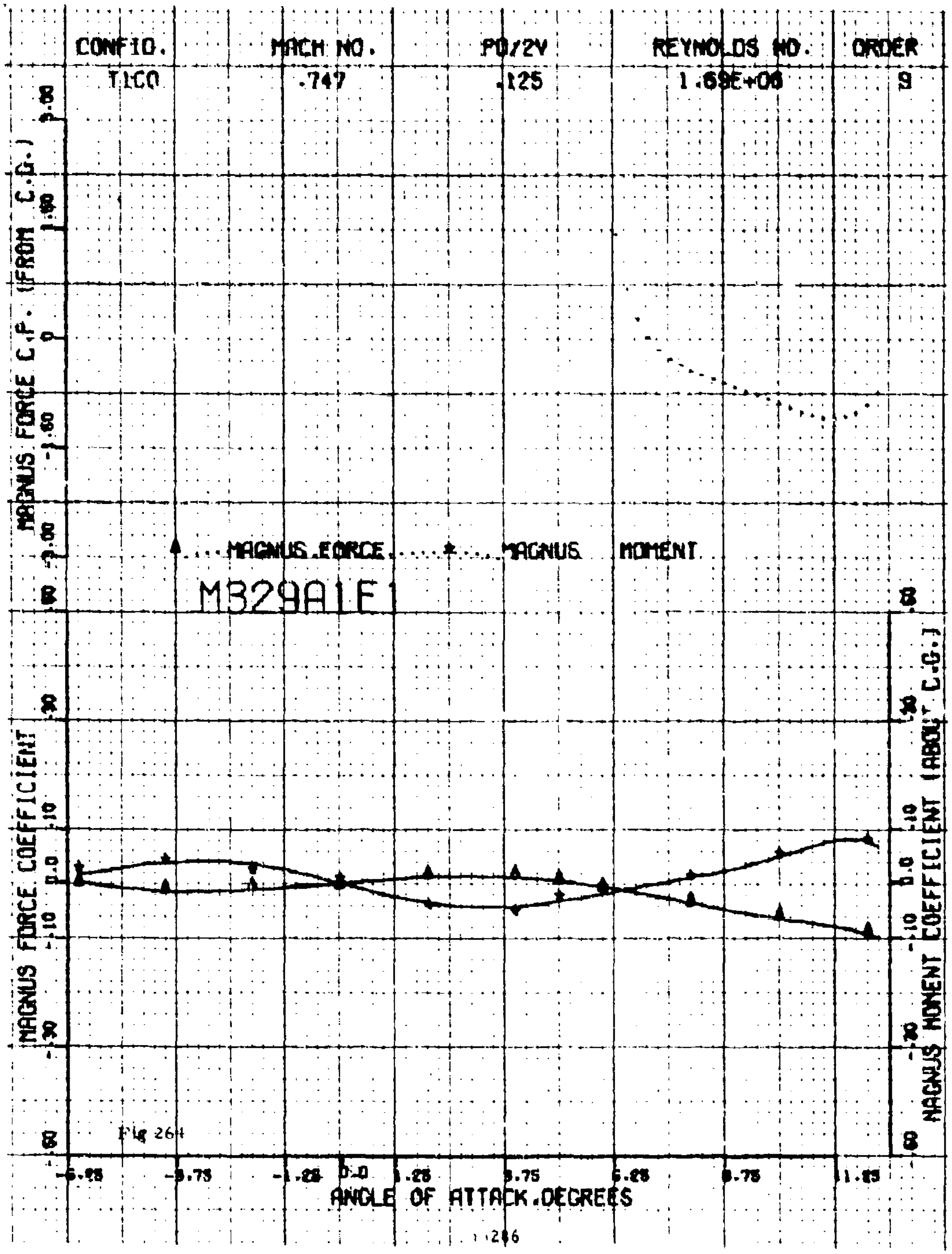


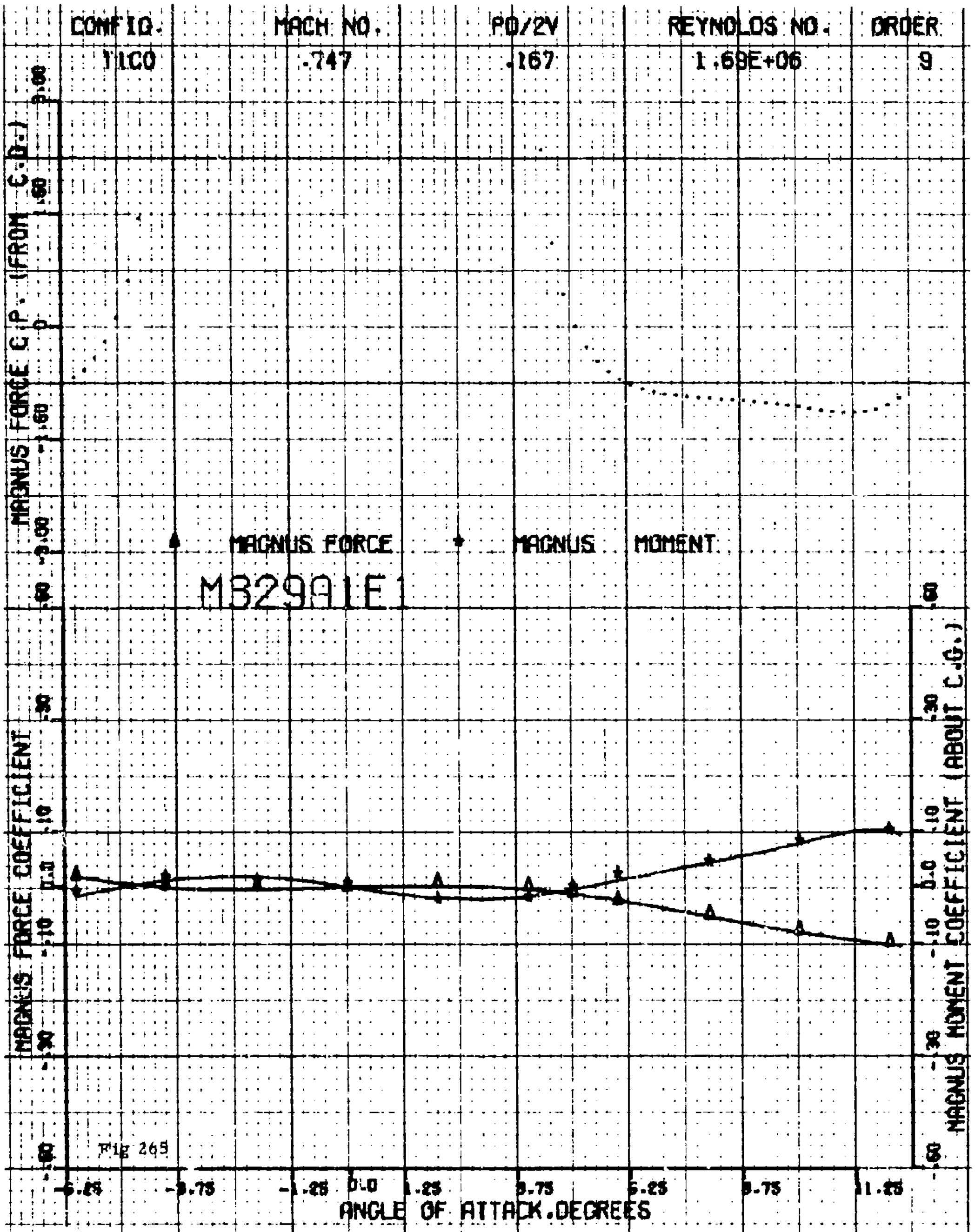
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.747
.063
1.69E+06
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 262
ANGLE OF ATTACK,DEGREES



CONFIG.
T1C0
MACH NO.
.747
PD/2V
.083
REYNOLDS NO.
1.69E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

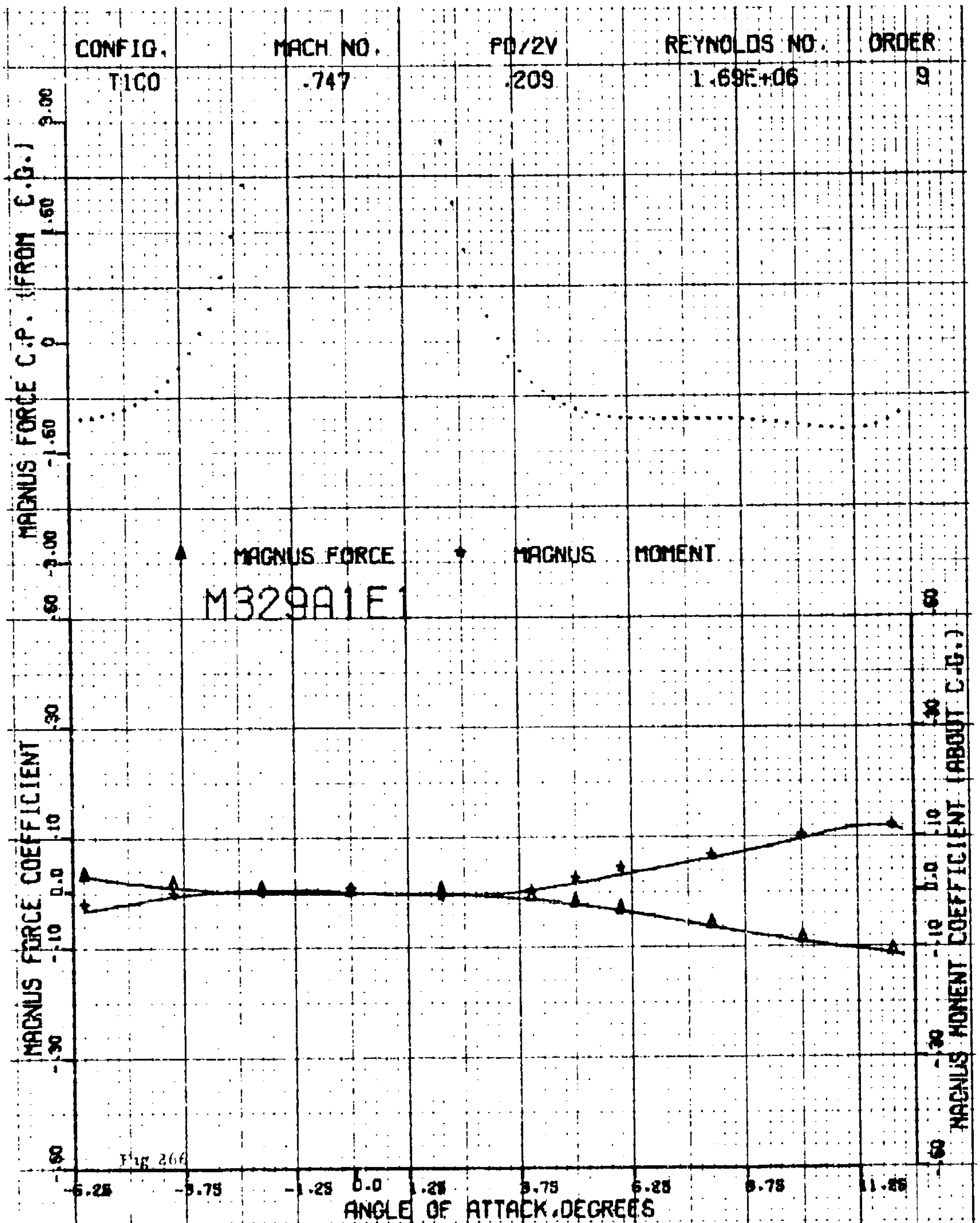
Fig 263


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1C0
.747
.125
1.69E+06
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 264



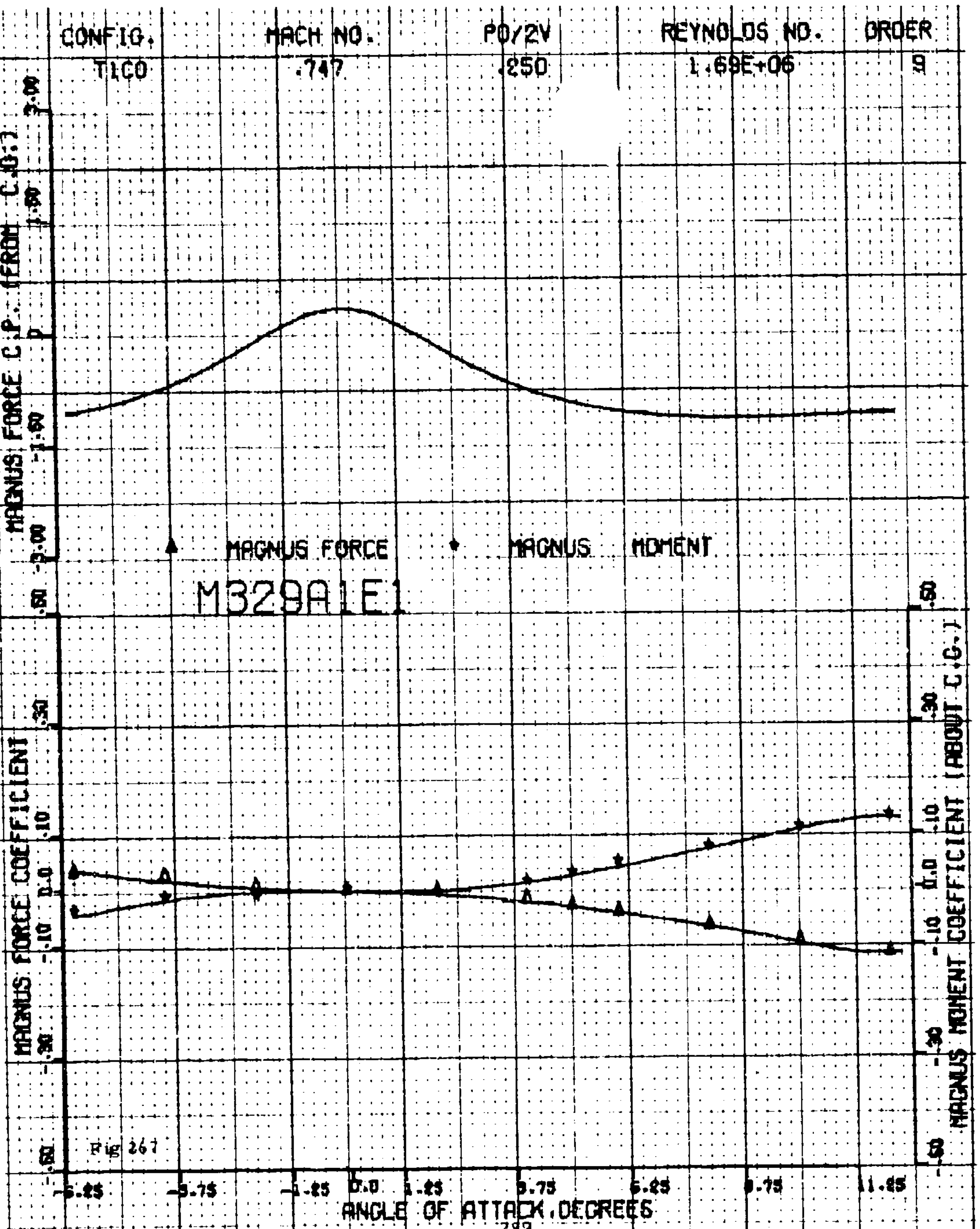
CONFIG.
11CO
MACH NO.
.747
PD/2V
.167
REYNOLDS NO.
1.69E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M32991E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 265



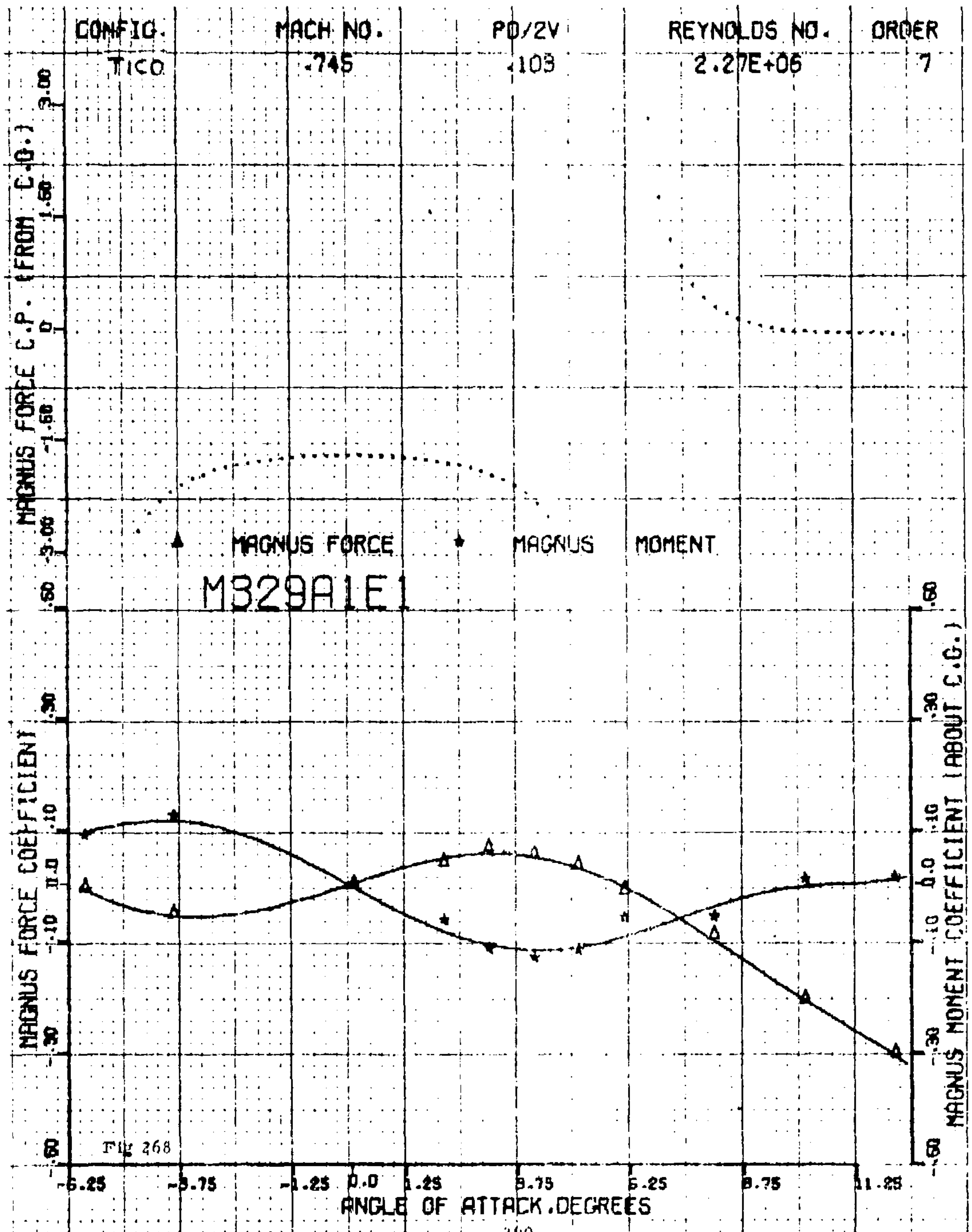
CONFIG. T1CO
MACH NO. .747
PD/2V .209
REYNOLDS NO. 1.69E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25

Fig 266



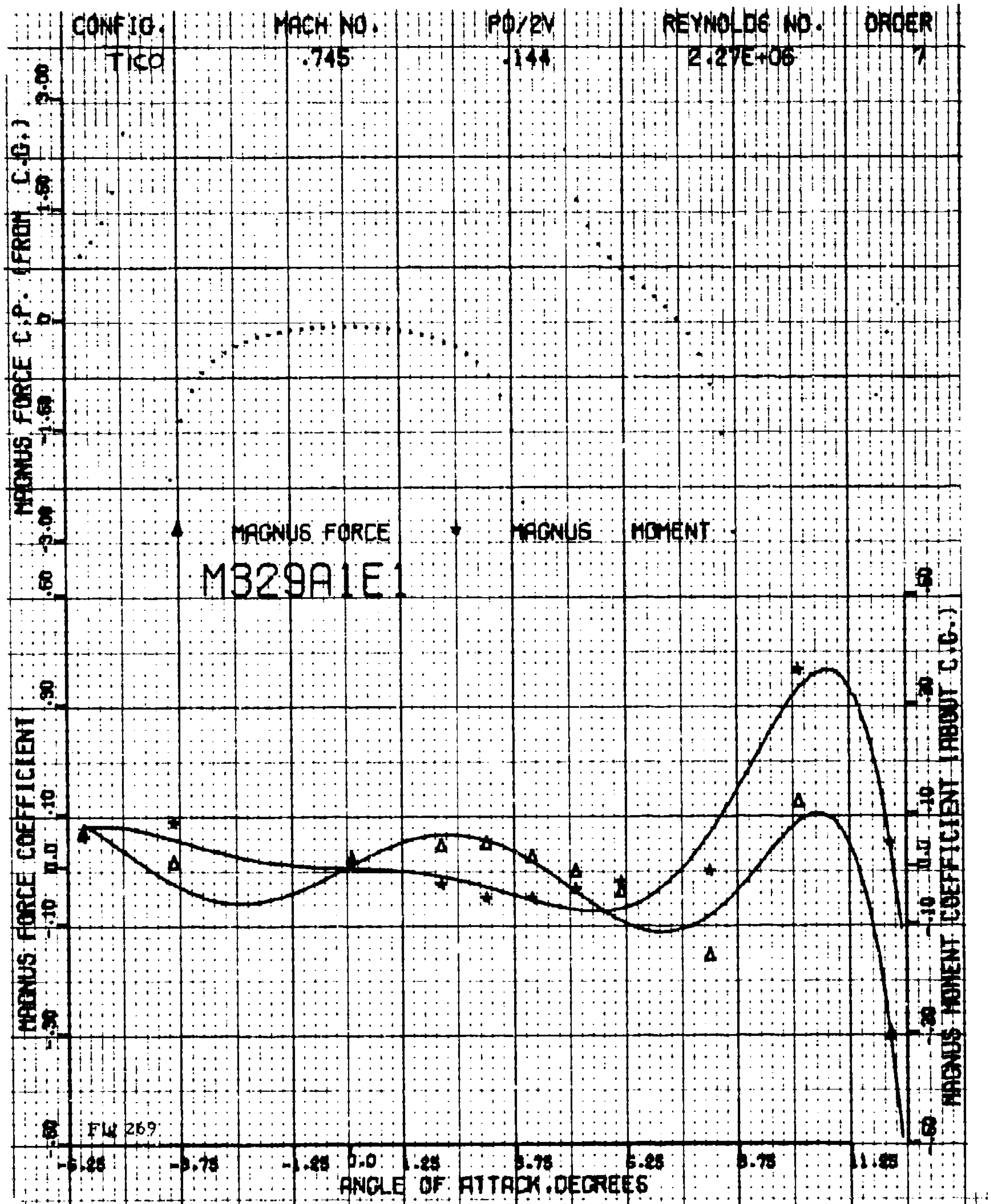
CONFIG.
T1C0
MACH NO.
.747
PD/2V
.250
REYNOLDS NO.
1.69E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 267



CONFIG.
TICO
MACH NO.
.745
PD/2V
.103
REYNOLDS NO.
2.27E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 268


CONFIG. TICO
MACH NO. .745
PD/2V .144
REYNOLDS NO. 2.27E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
FIG 269
ANGLE OF ATTACK,DEGREES
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25

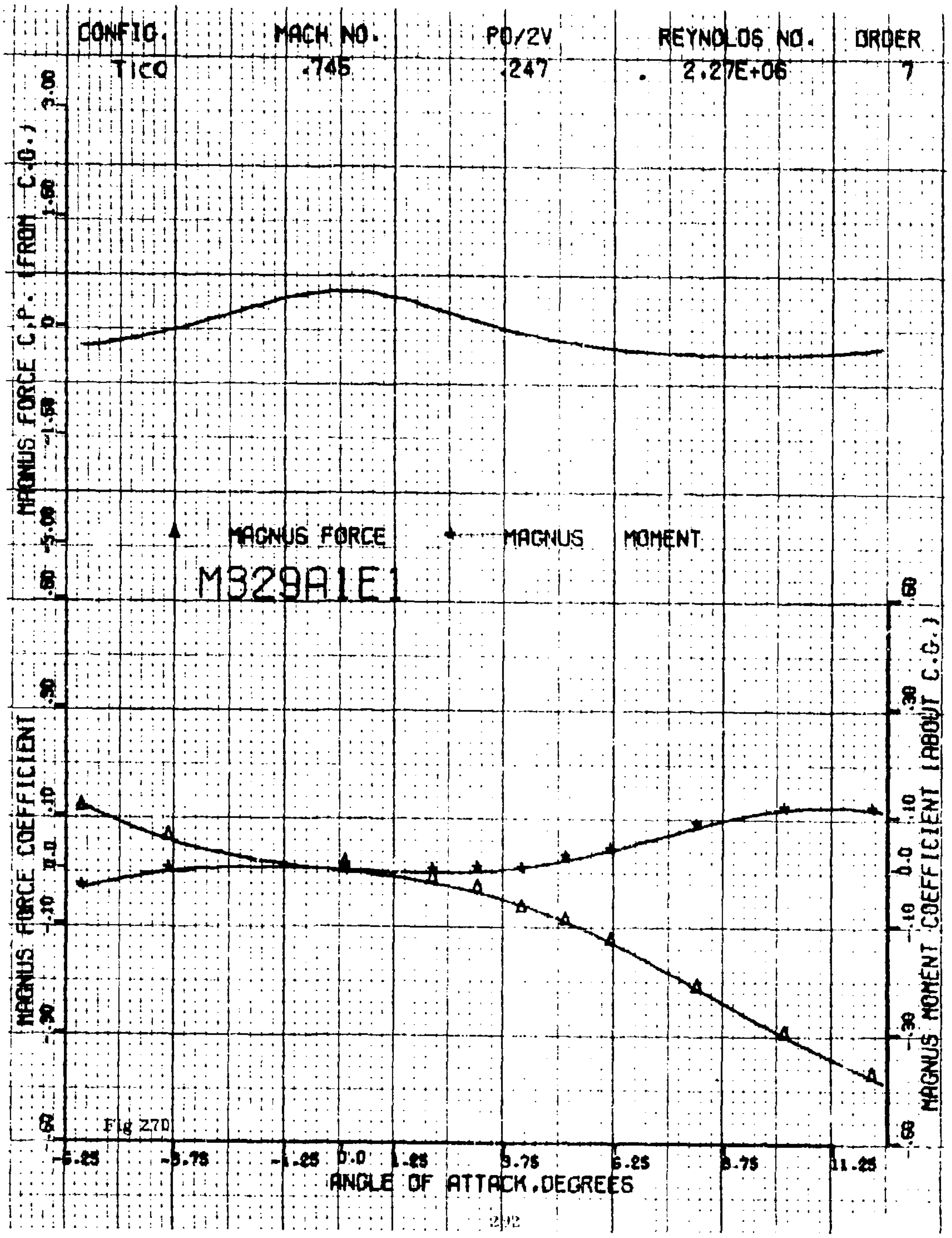

CONFIG. TICO
MACH NO. .745
PD/2V .247
REYNOLDS NO. 2.27E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 270

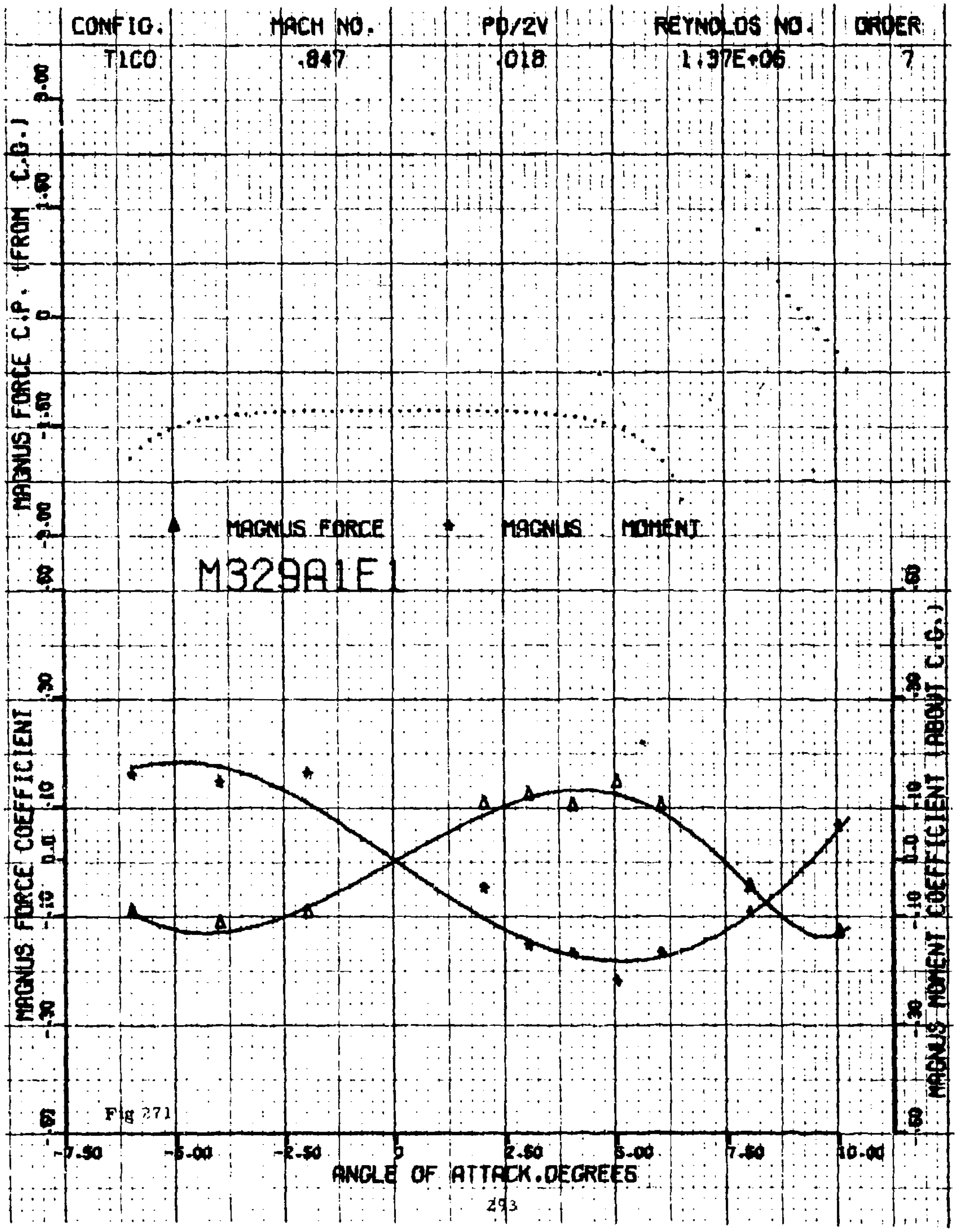
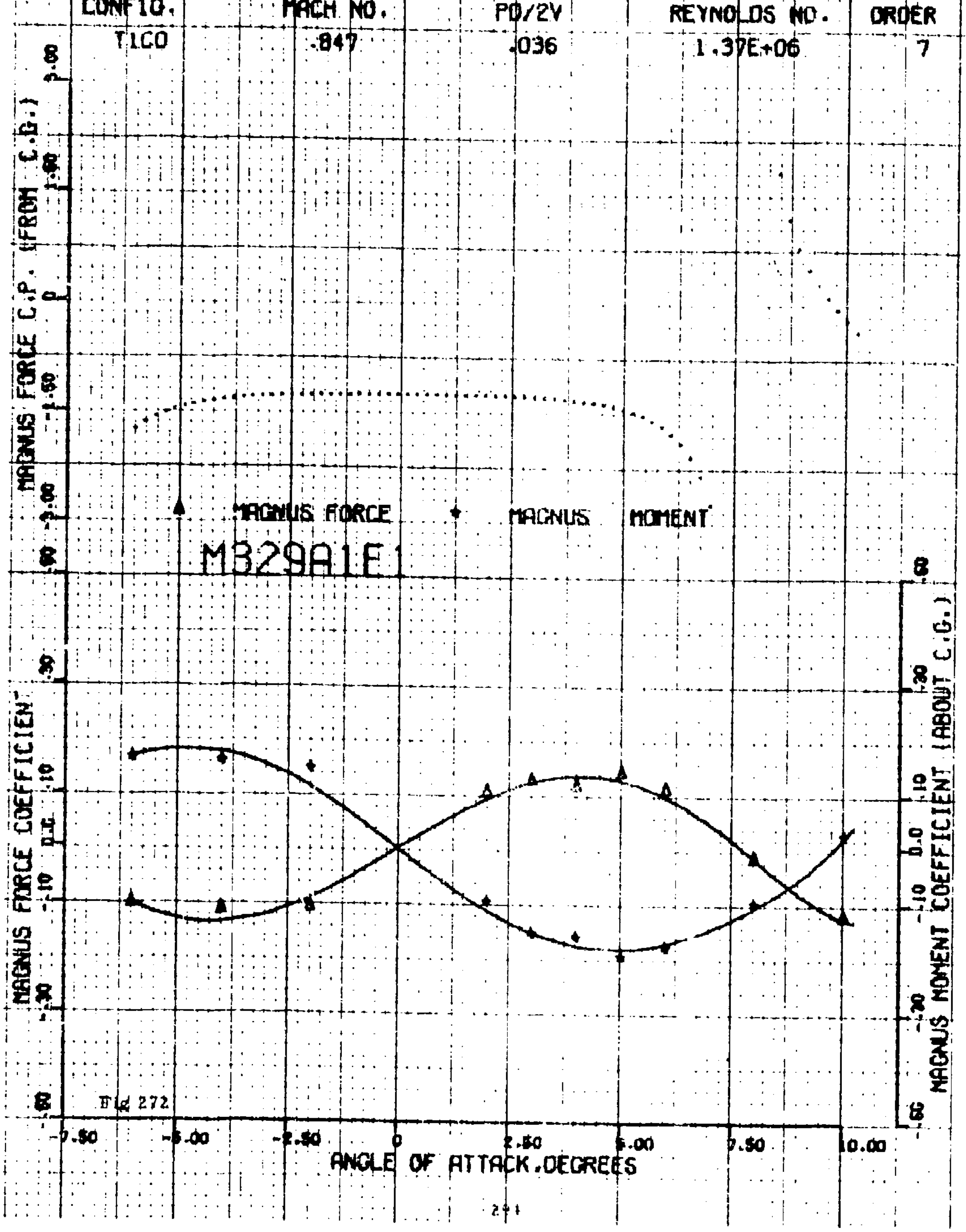
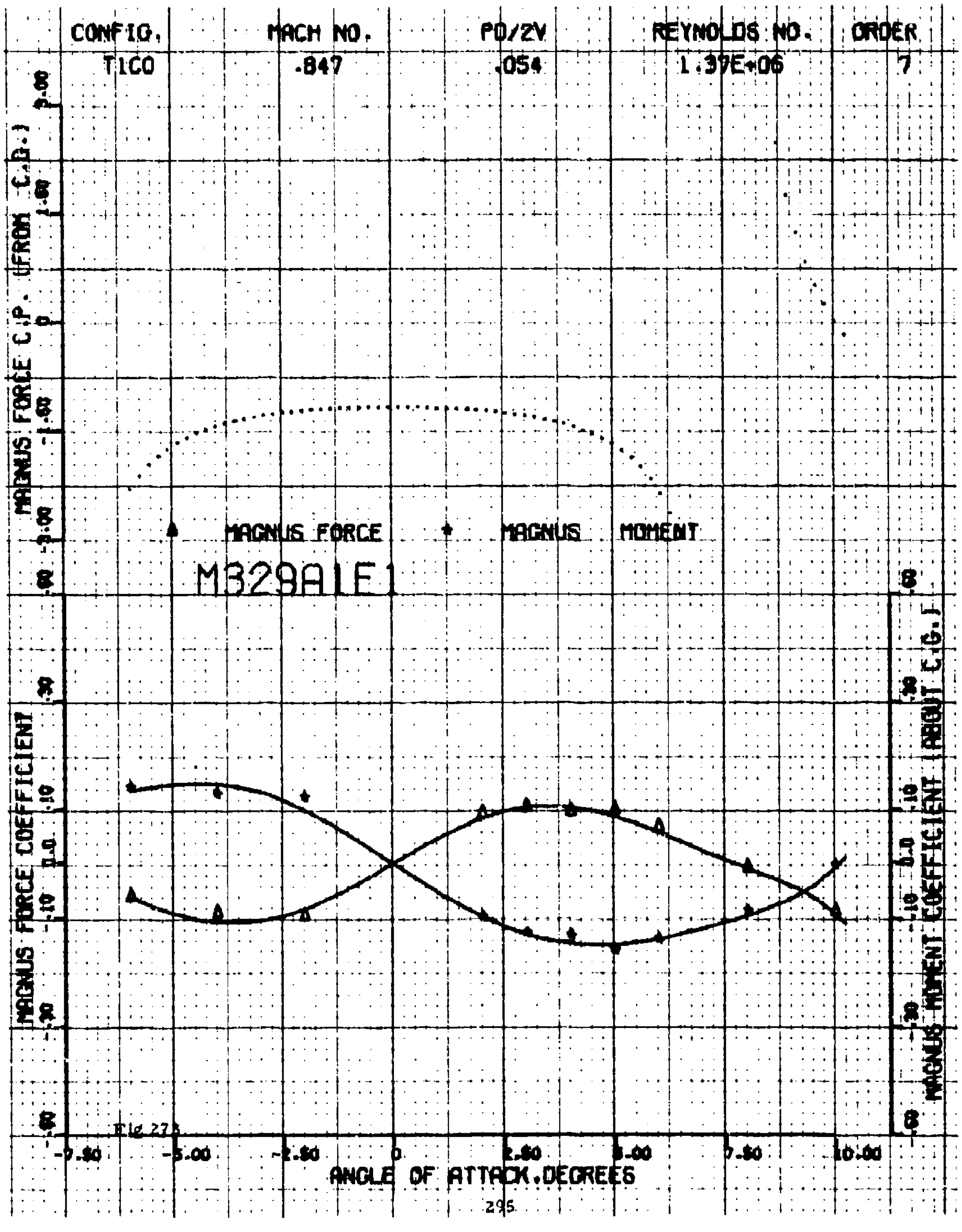

CONFIG. T1CO
MACH NO. .847
PD/2V .018
REYNOLDS NO. 1.37E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 271



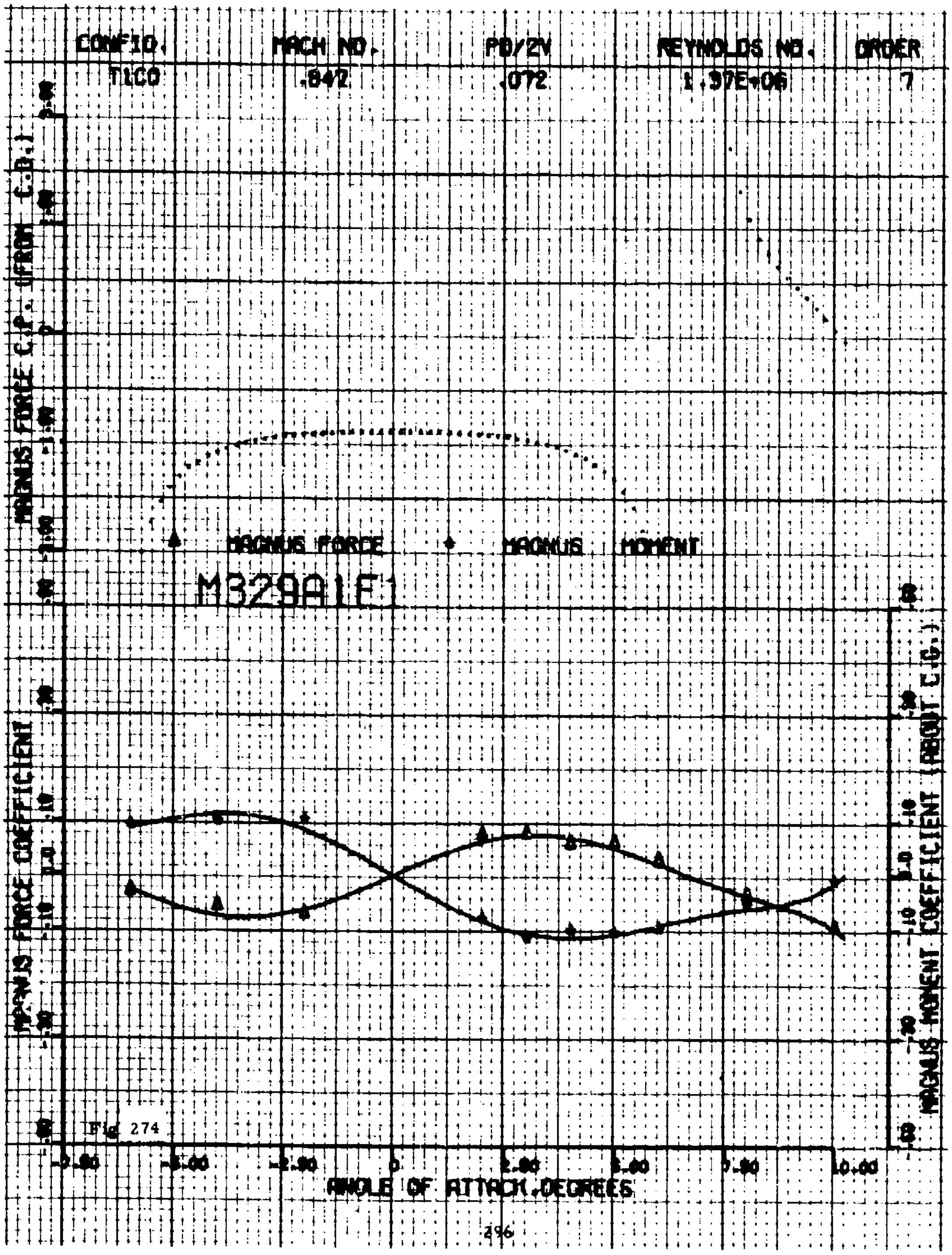
CONFIG. T1CO
MACH NO. .847
PD/2V .036
REYNOLDS NO. 1.37E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 272



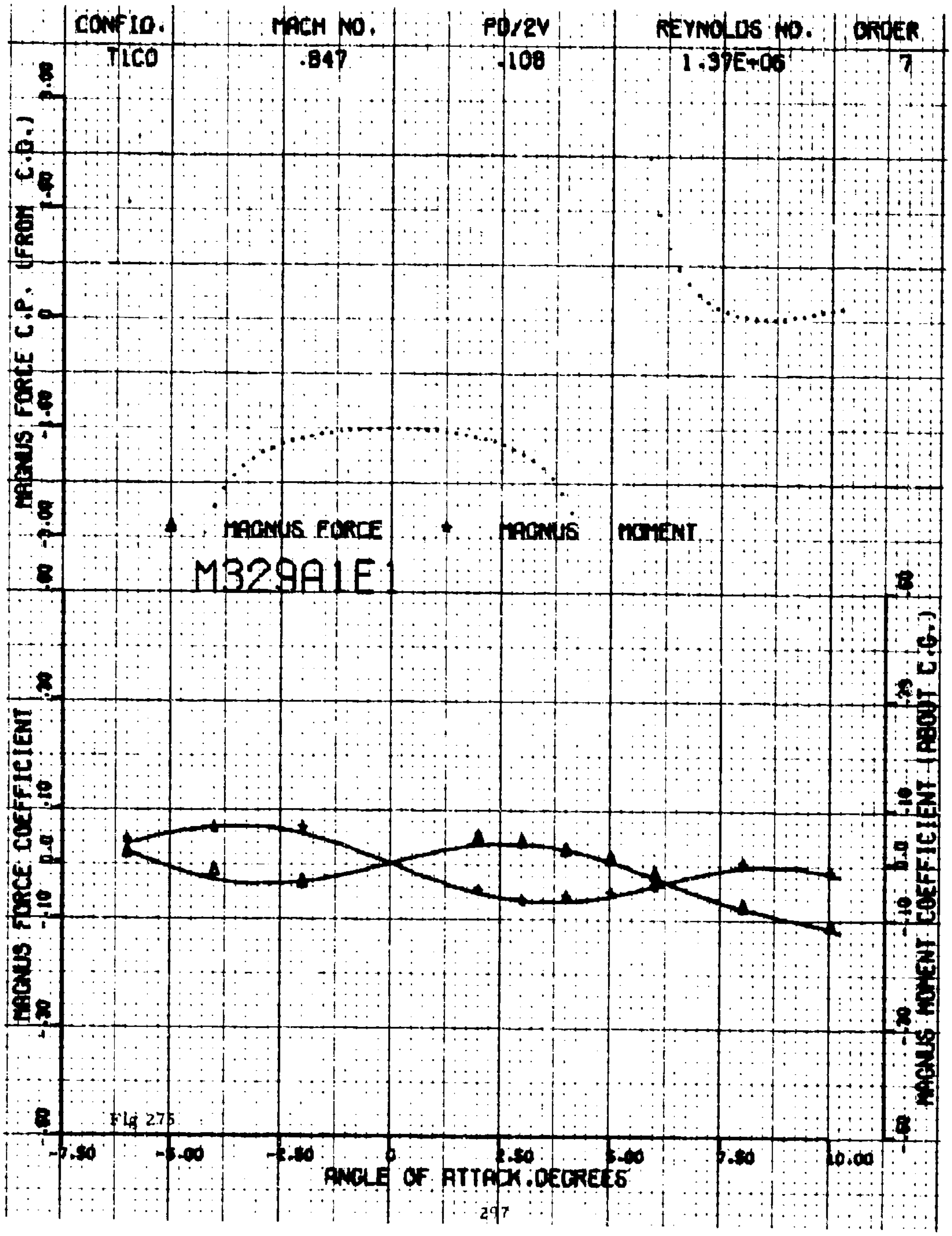
CONFIG. T1CO
MACH NO. .847
PD/2V .054
REYNOLDS NO. 1.37E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 27



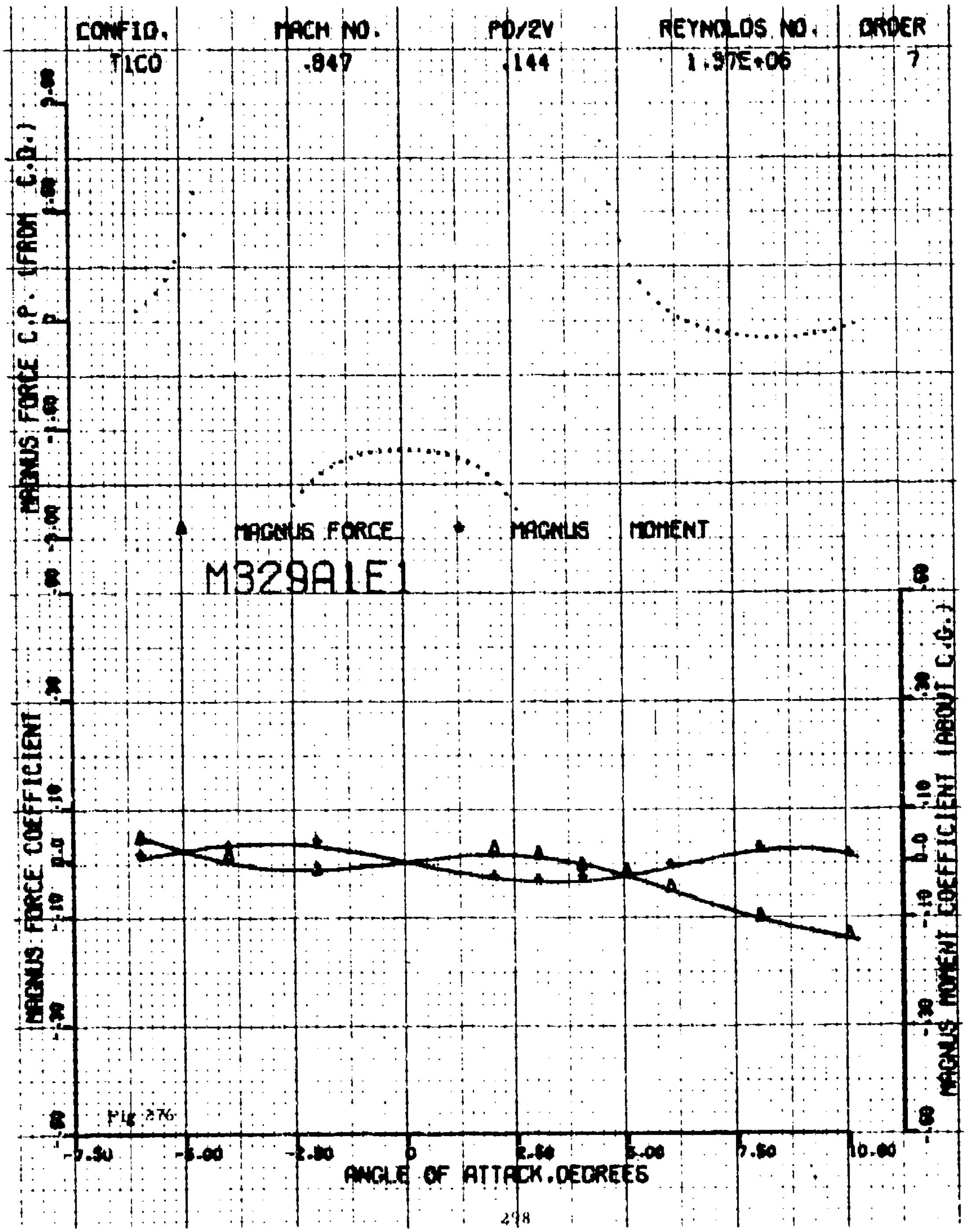
CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1CO .847 .072 1.37E+06 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-10.00 -5.00 -2.50 0 2.50 5.00 7.50 10.00

Fig 274



CONFIG.
TLCO
MACH NO.
.847
PD/2V
.108
REYNOLDS NO.
1.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 275


CONFIG. TICO
MACH NO. .847
PD/2V .144
REYNOLDS NO. 1.37E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 276

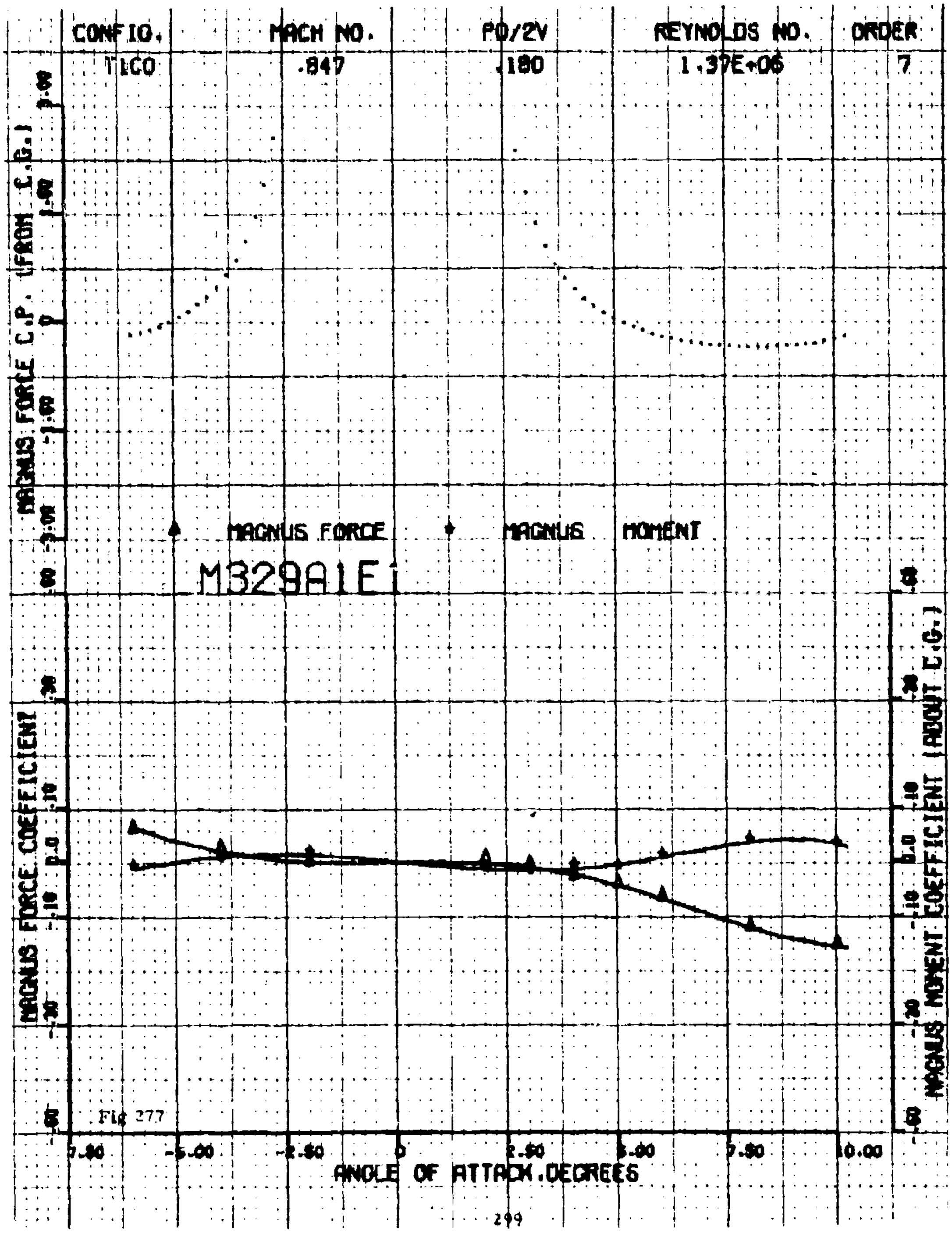

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T1CO
.847
.180
1.37E+06
7
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 277

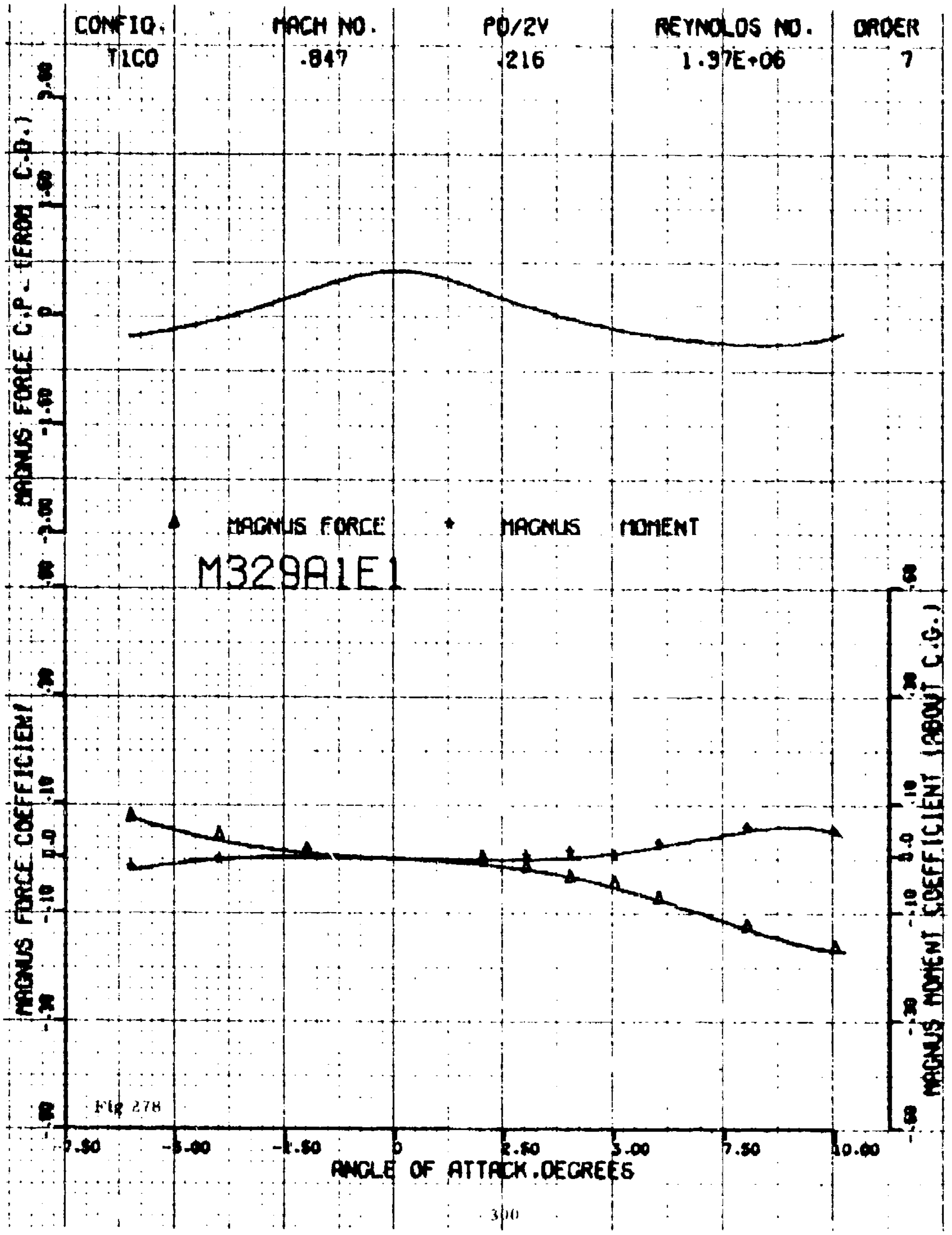

CONFIG.
T1CO
MACH NO.
.847
PD/2V
.216
REYNOLDS NO.
1.37E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

Fig 278

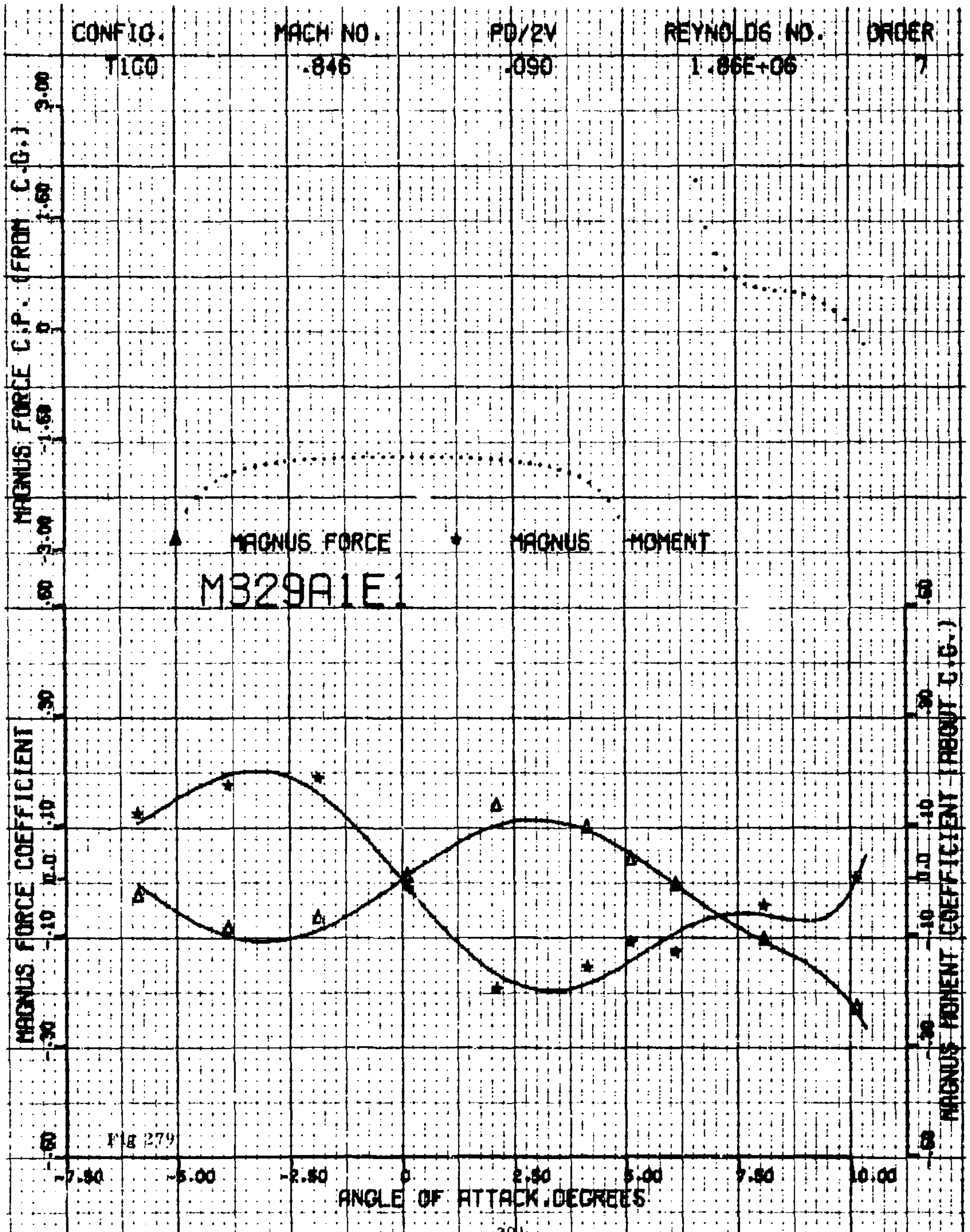
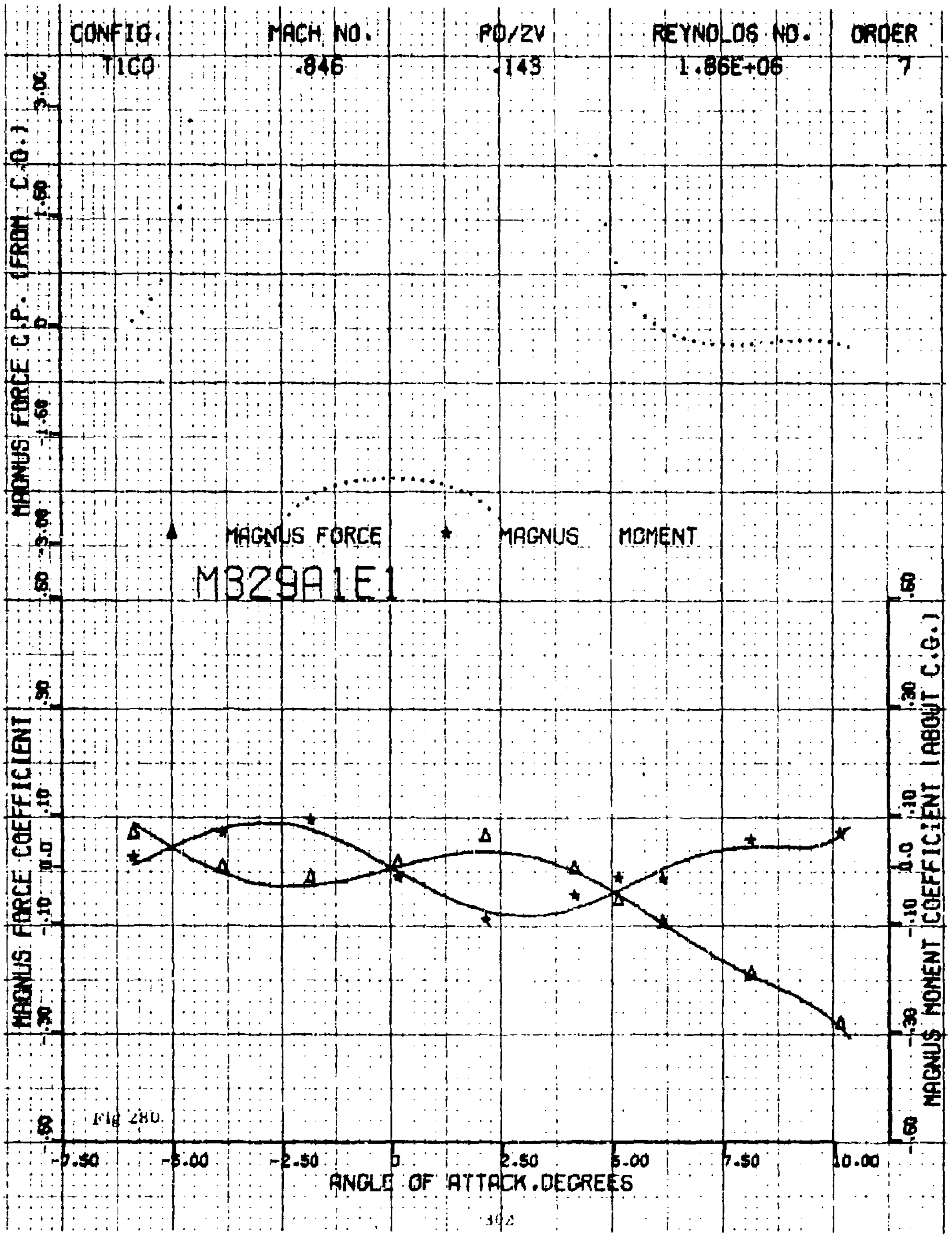
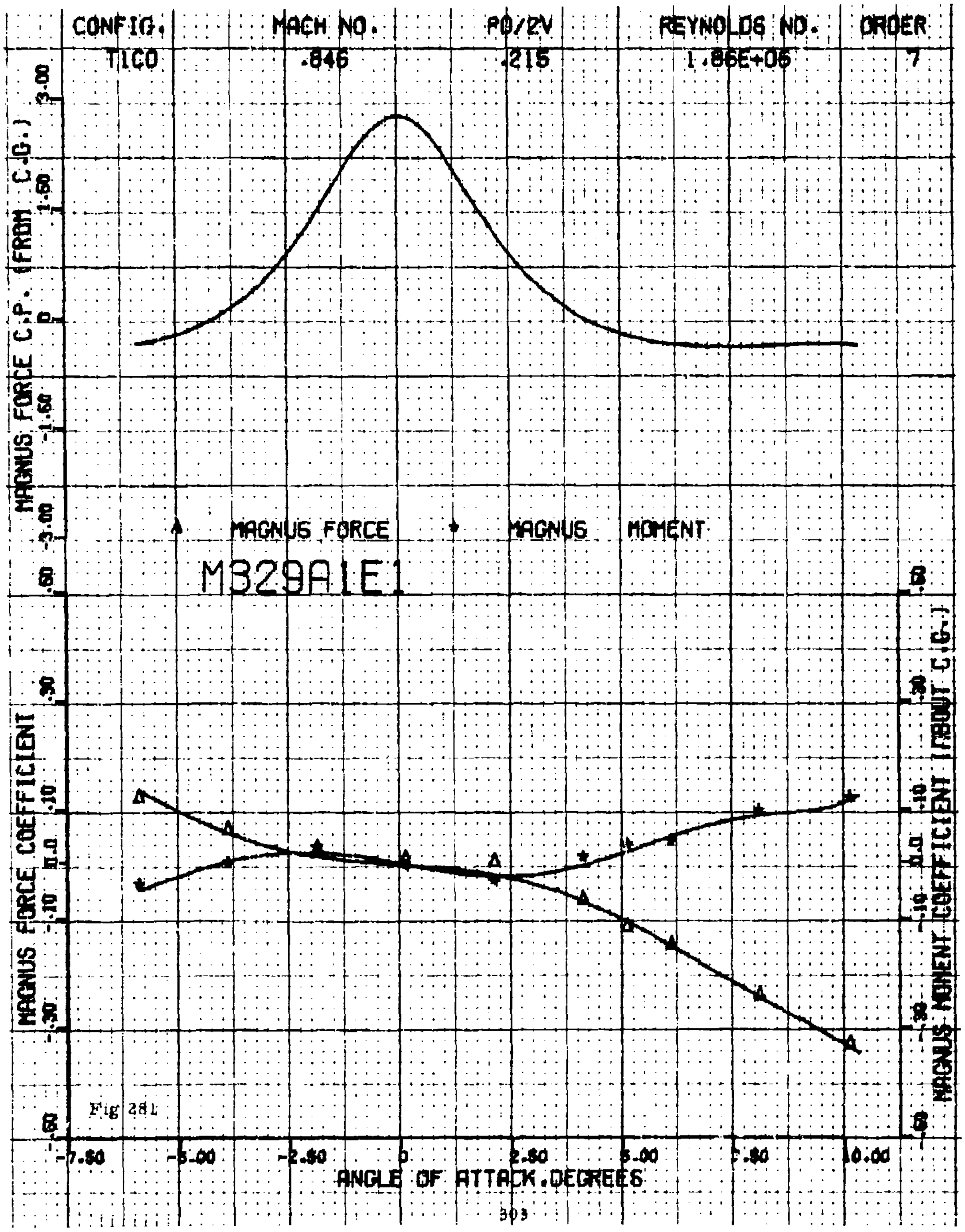

CONFIG. T1C0
MACH NO. .846
PD/2V .090
REYNOLDS NO. 1.86E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.50
.30
.10
0.0
-.10
-.30
-.50
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig 279



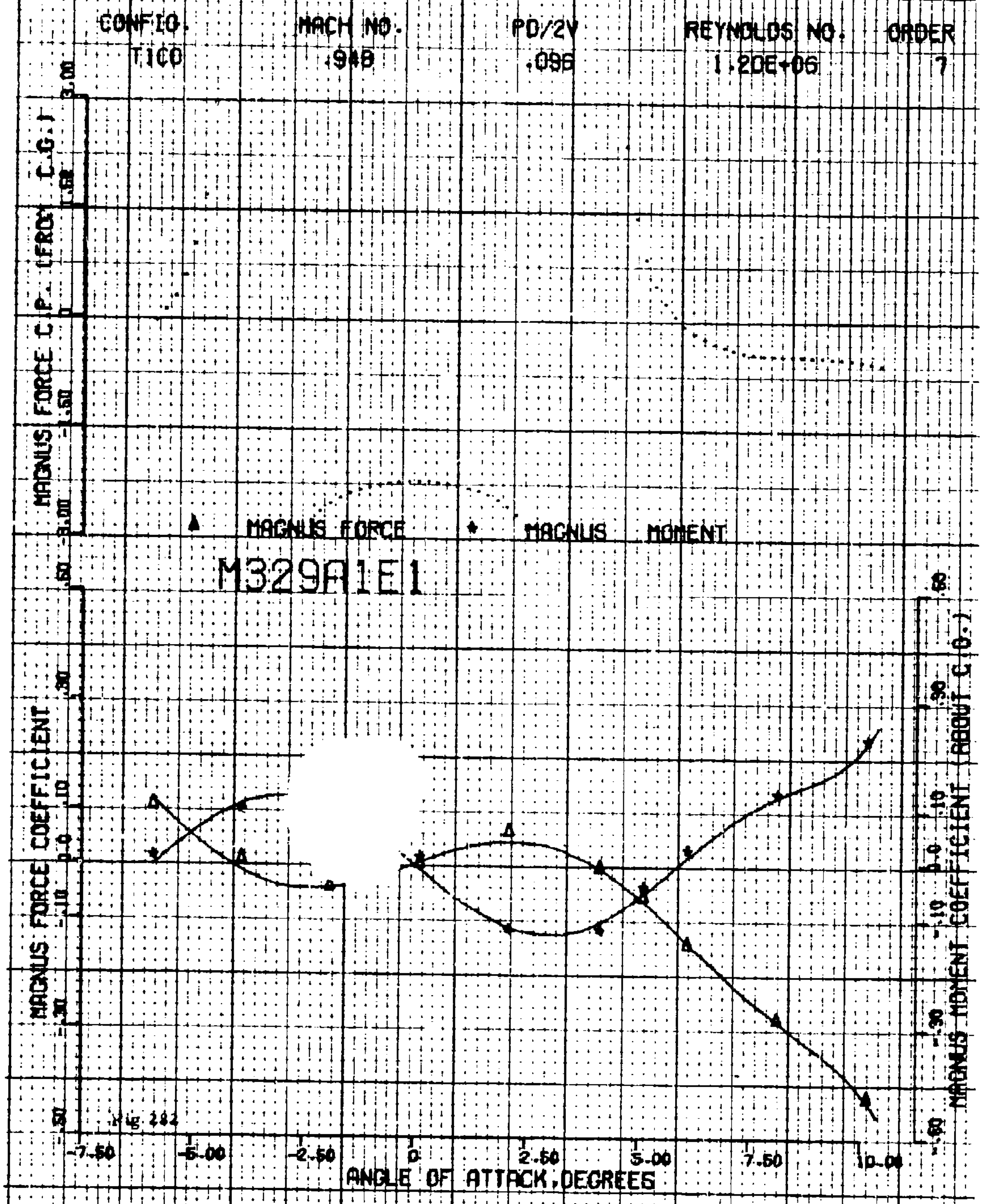
CONFIG.
T1CO
MACH NO.
.846
PD/2V
.143
REYNOLDS NO.
1.86E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00

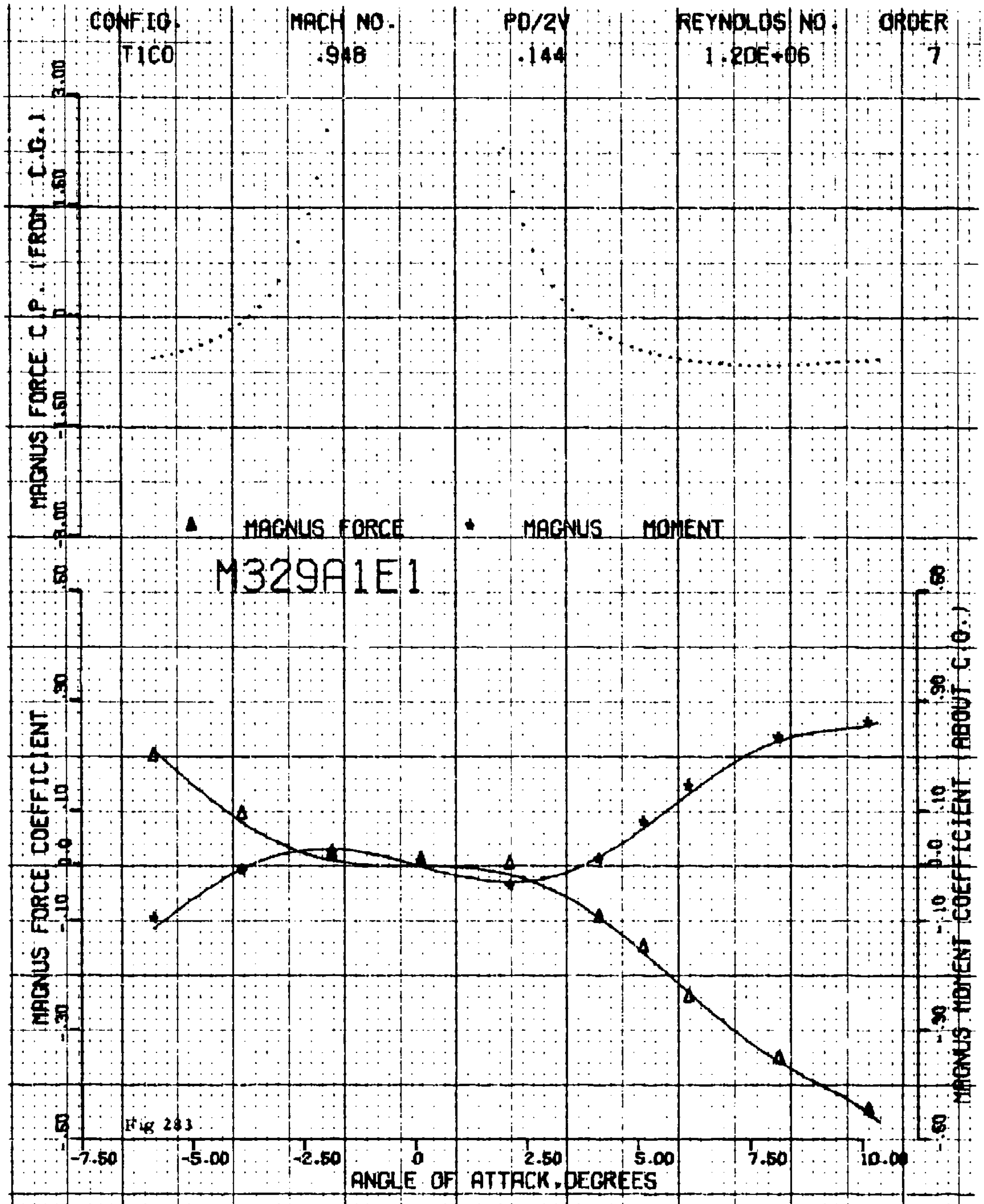
Fig 280.



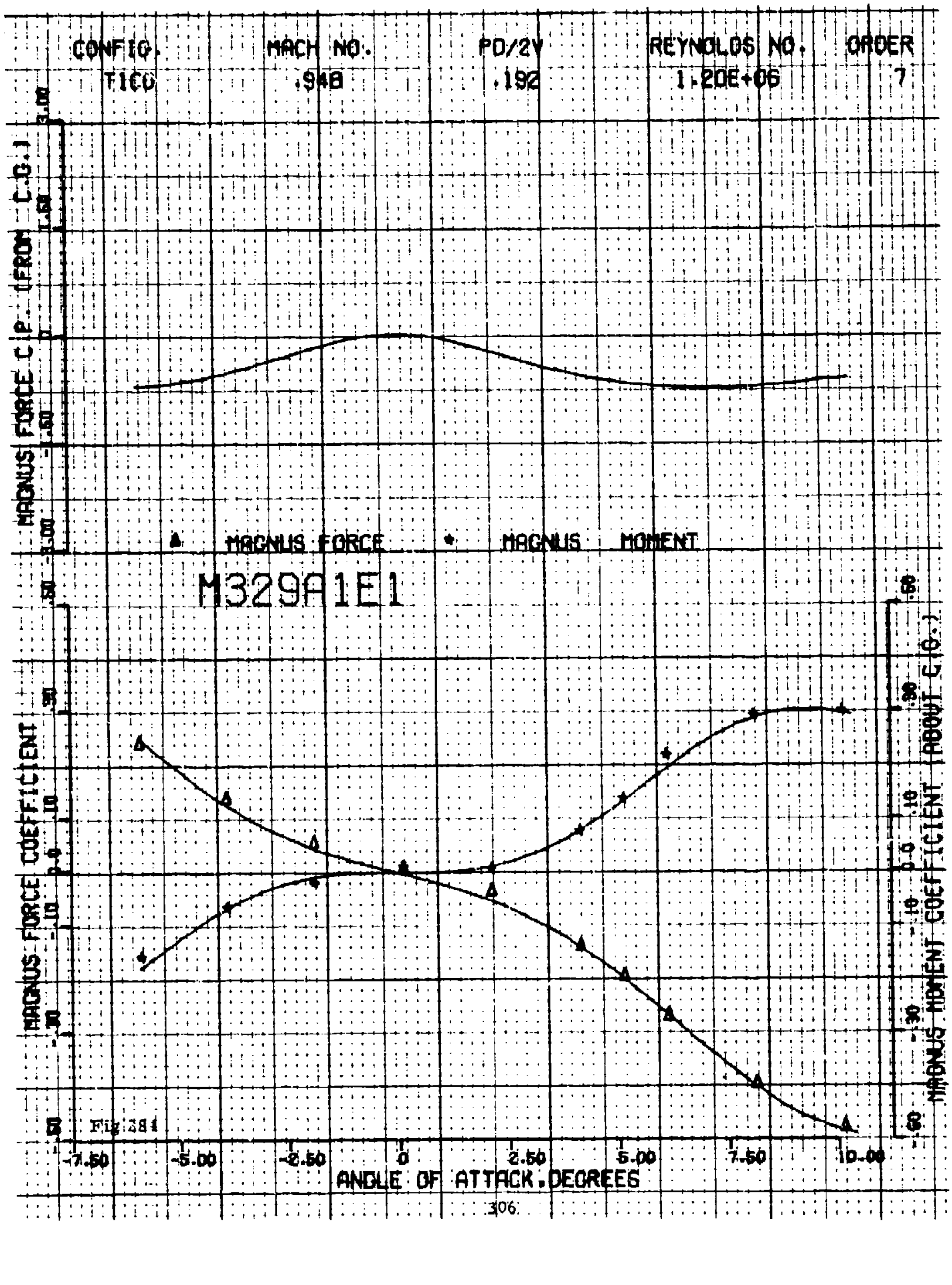
CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.846
.215
1.86E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 281


CONFIG. TICO
MACH NO. .948
PD/2V .096
REYNOLDS NO. 1.20E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES
Fig 282

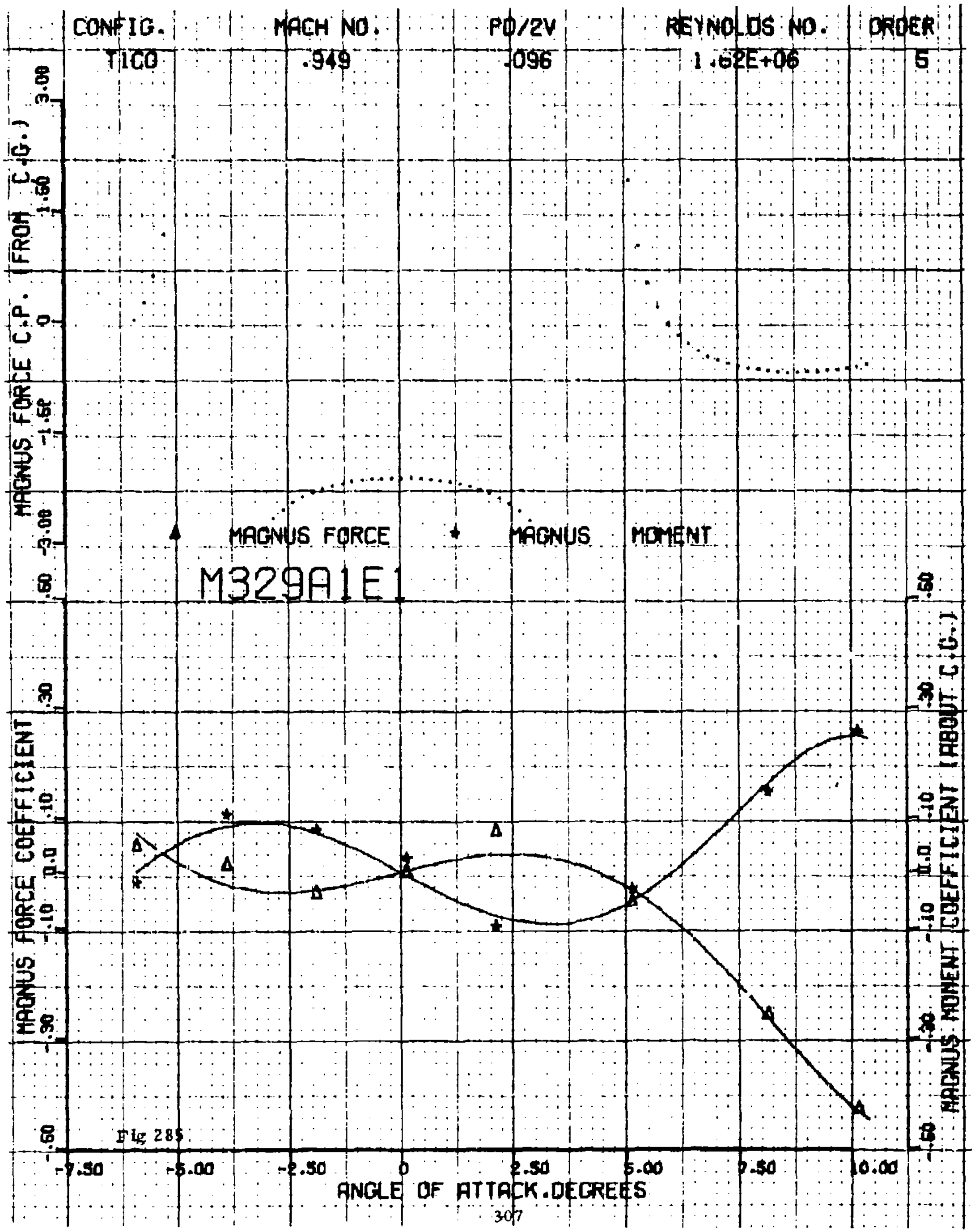


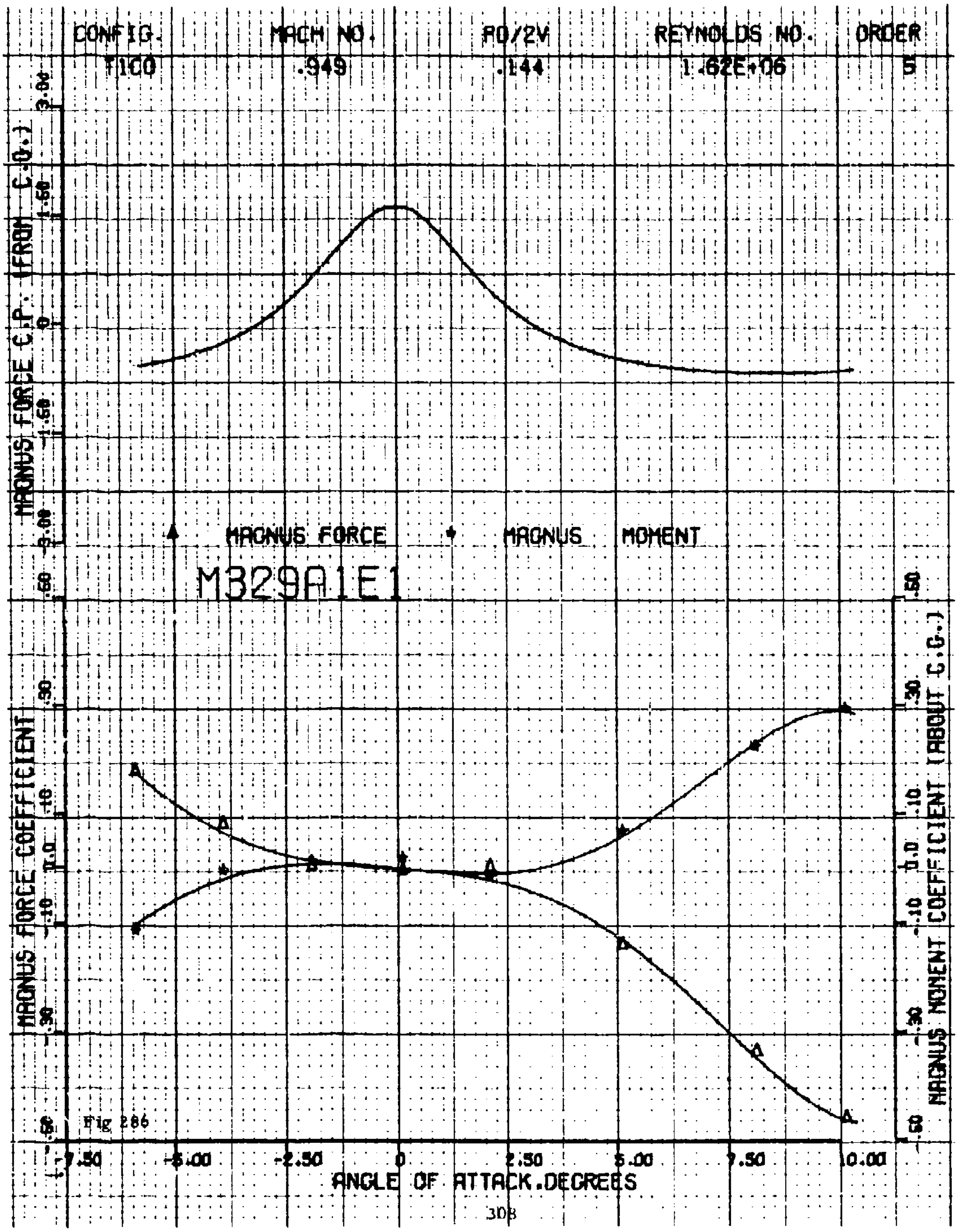
CONFIG.
TICO
MACH NO.
.948
PD/2V
.144
REYNOLDS NO.
1.20E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 283
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

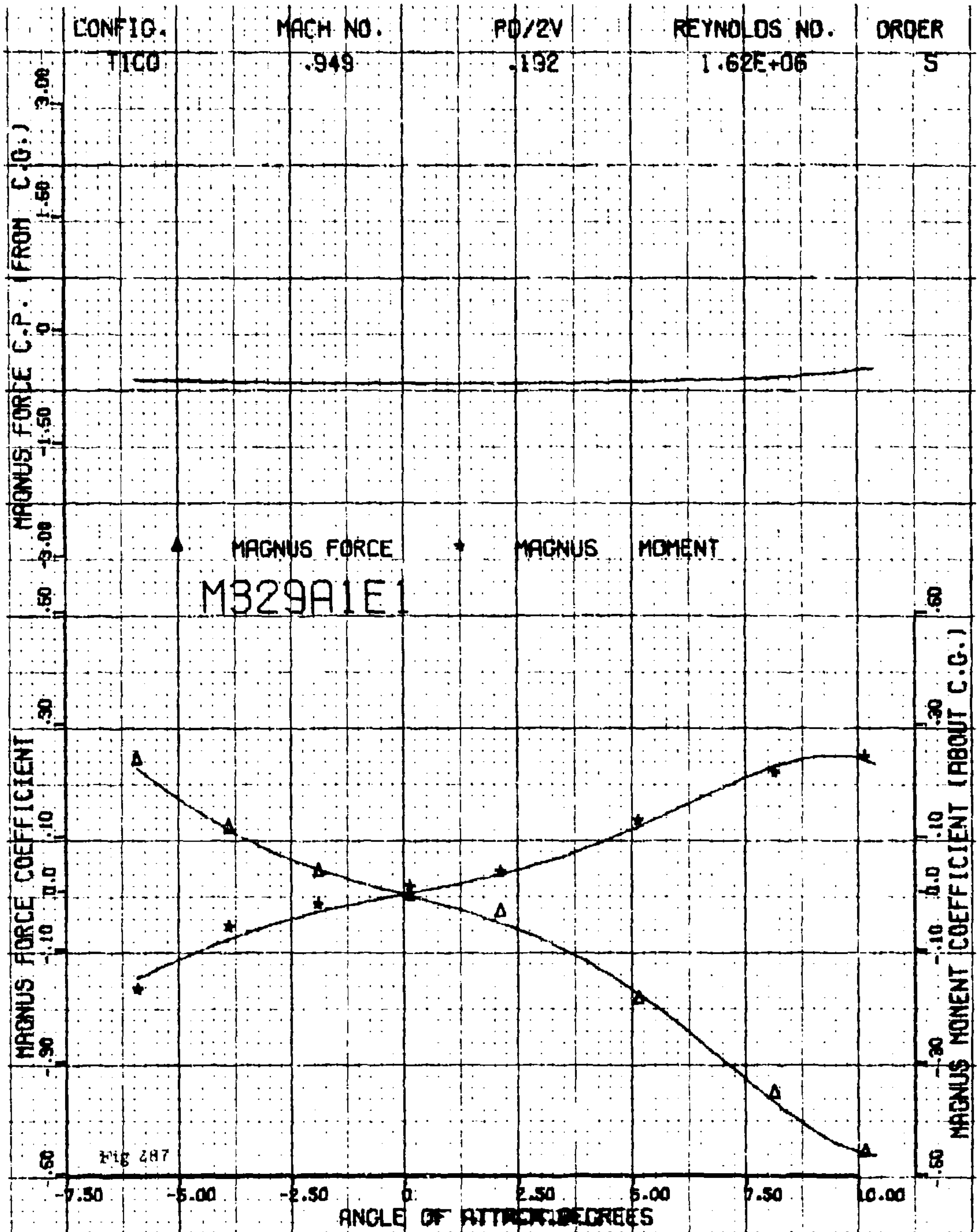


CONFIG.
TICU
MACH NO.
.948
PD/2V
.192
REYNOLDS NO.
1.20E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig. 384


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
TICO
.949
.096
1.62E+06
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 285


CONFIG.
T1C0
MACH NO.
.949
PD/2V
.144
REYNOLDS NO.
1.62E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
Fig 286



CONFIG.
TICO
MACH NO.
.949
PD/2V
.192
REYNOLDS NO.
1.62E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 487
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK DEGREES

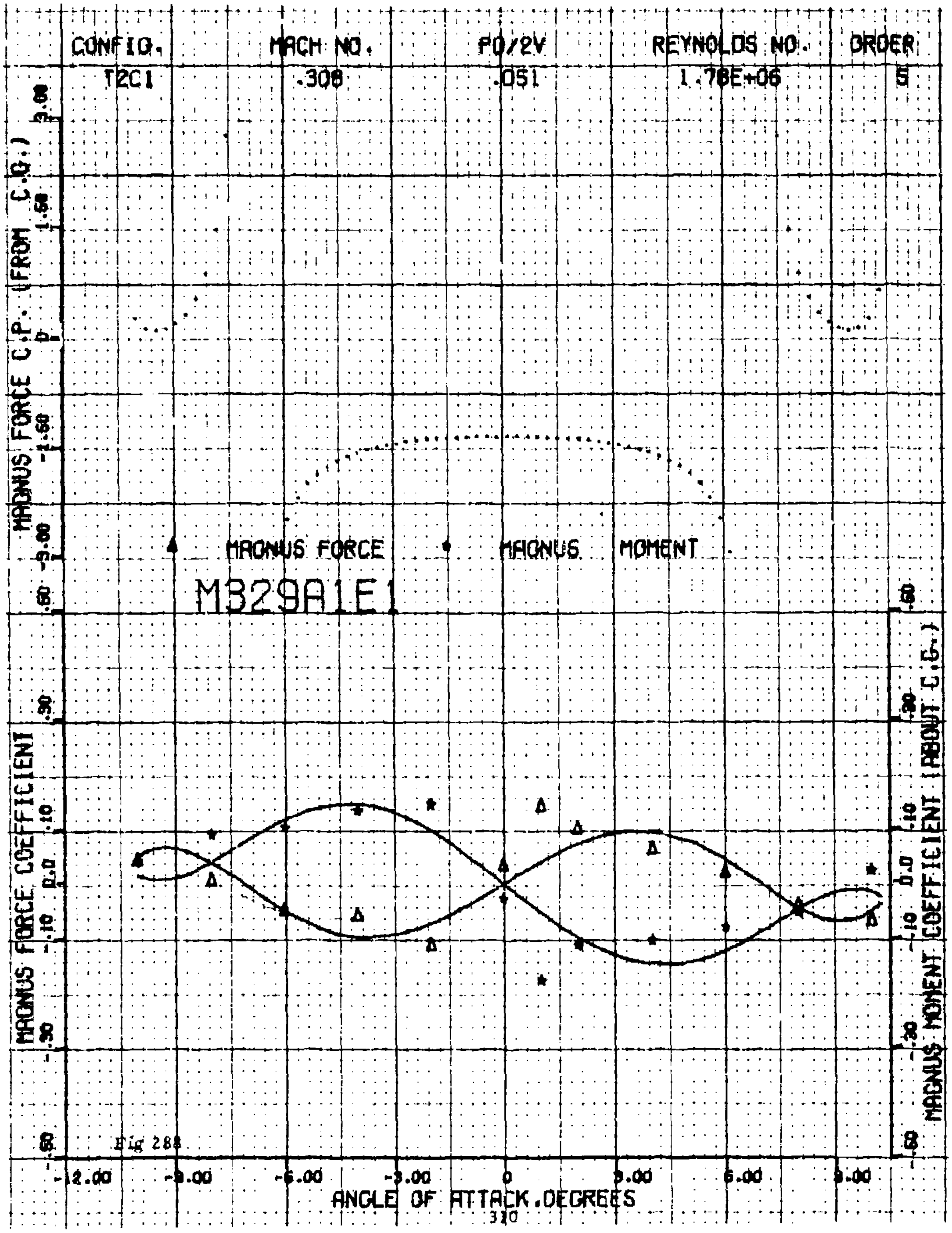
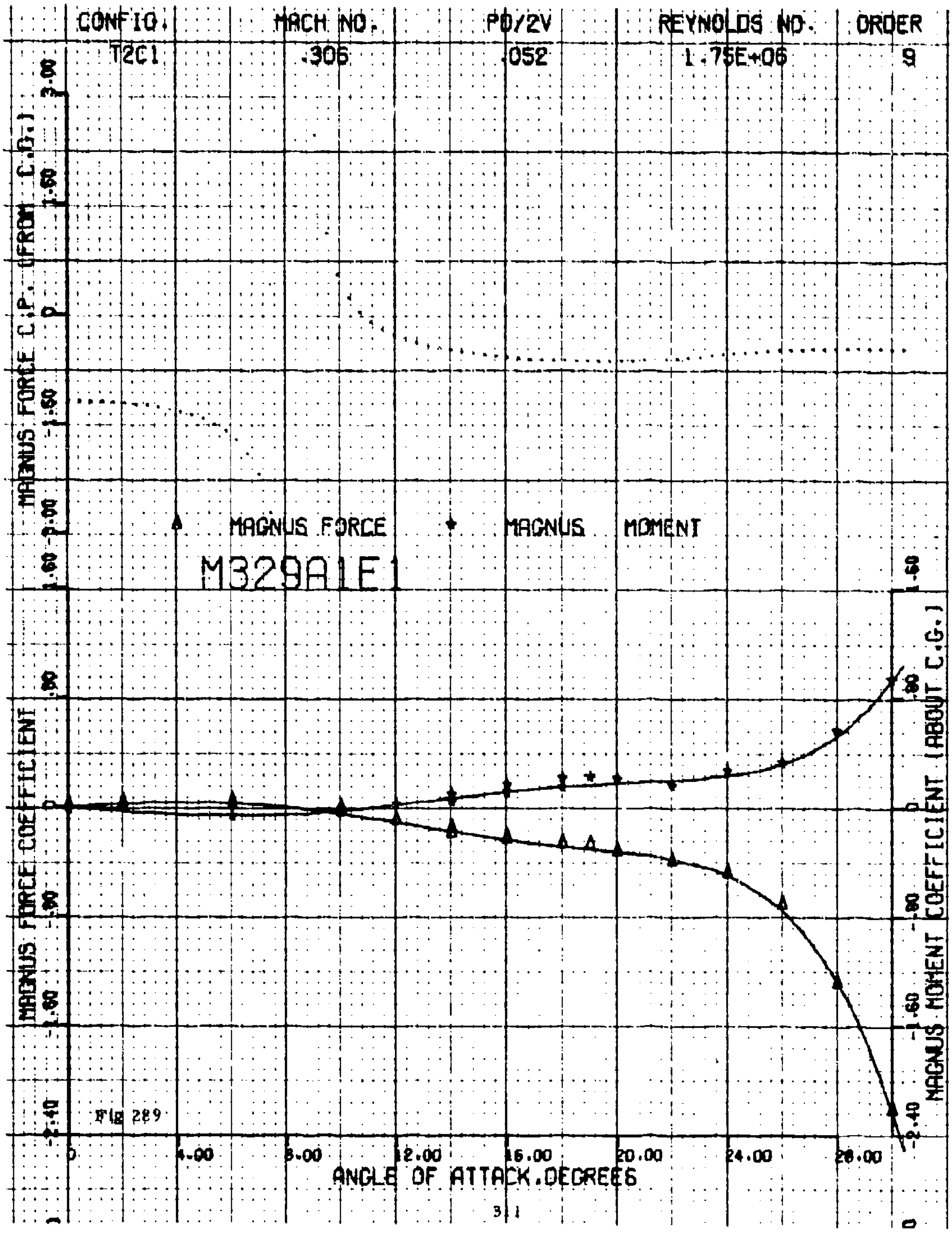
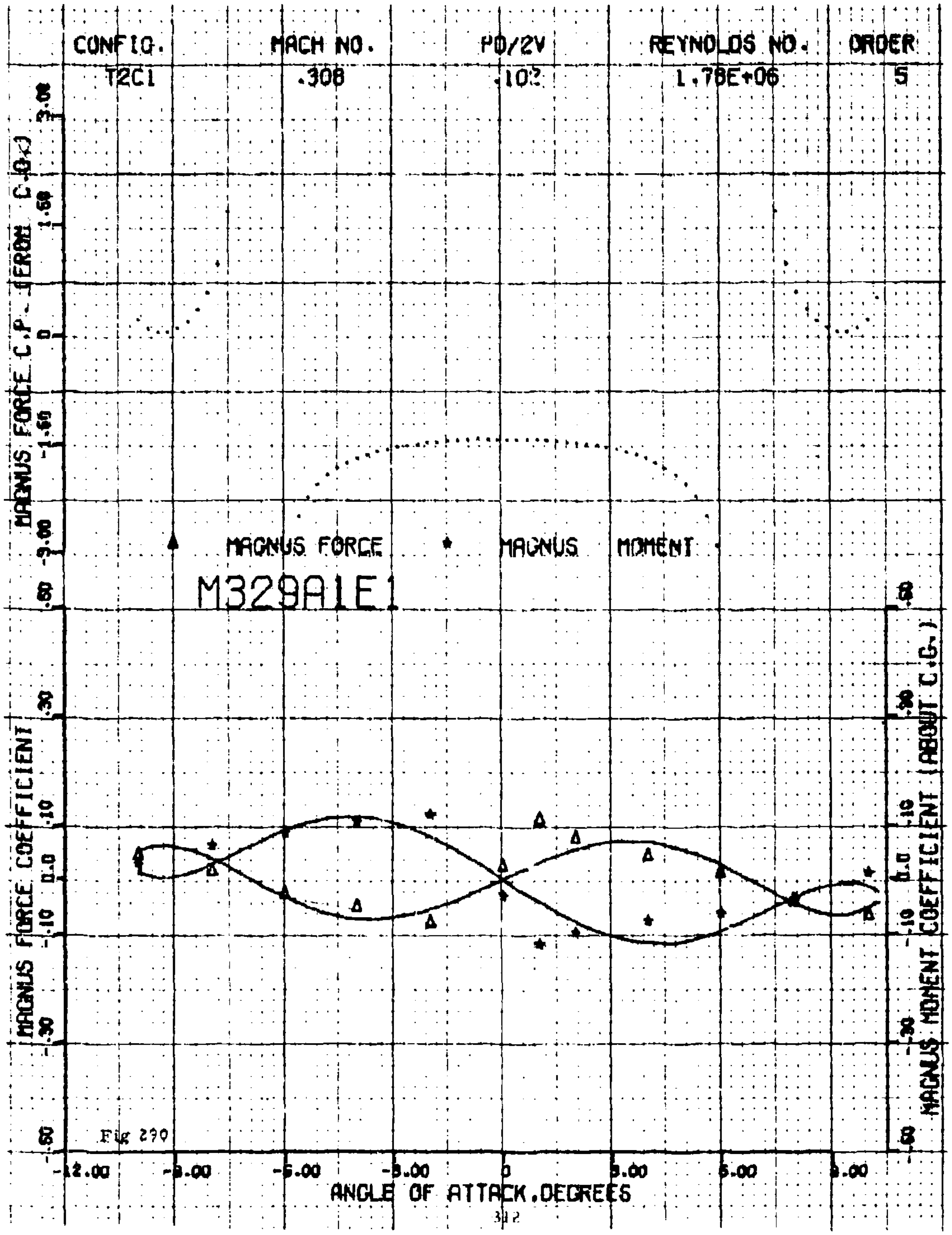

CONFIG.
T2C1
MACH NO.
.308
PD/2V
.051
REYNOLDS NO.
1.78E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
ANGLE OF ATTACK, DEGREES

Fig 288

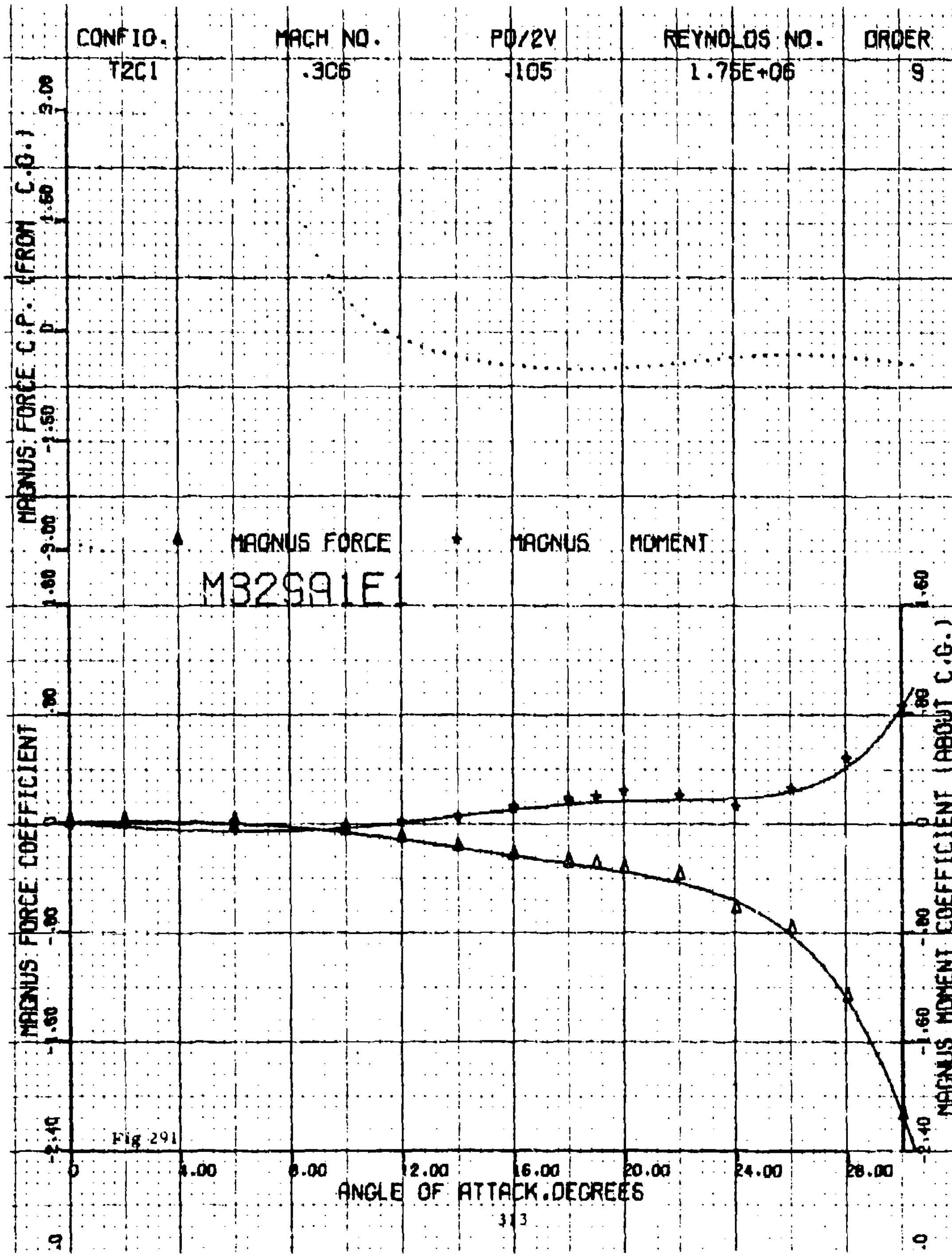


CONFIG. T2C1
MACH NO. .306
PD/2V .052
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00
Fig 289



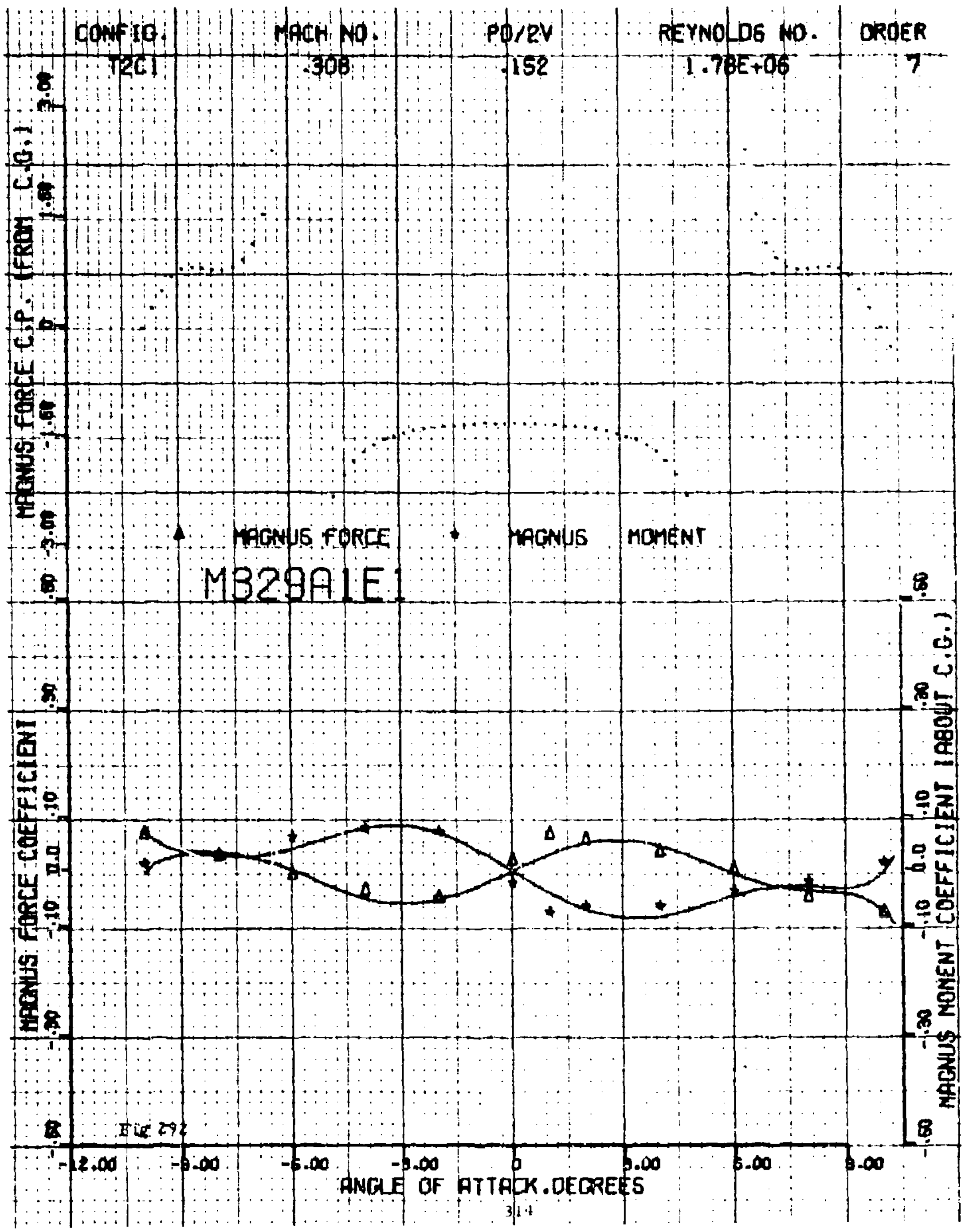
CONFIG.
T2C1
MACH NO.
.308
PD/2V
.102
REYNOLDS NO.
1.78E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 290



CONFIG.
T2C1
MACH NO.
.306
PD/2V
.105
REYNOLDS NO.
1.75E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M32S91E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 291


CONFIG. T2C1
MACH NO. .308
PD/2V .152
REYNOLDS NO. 1.78E+06
ORDER 7
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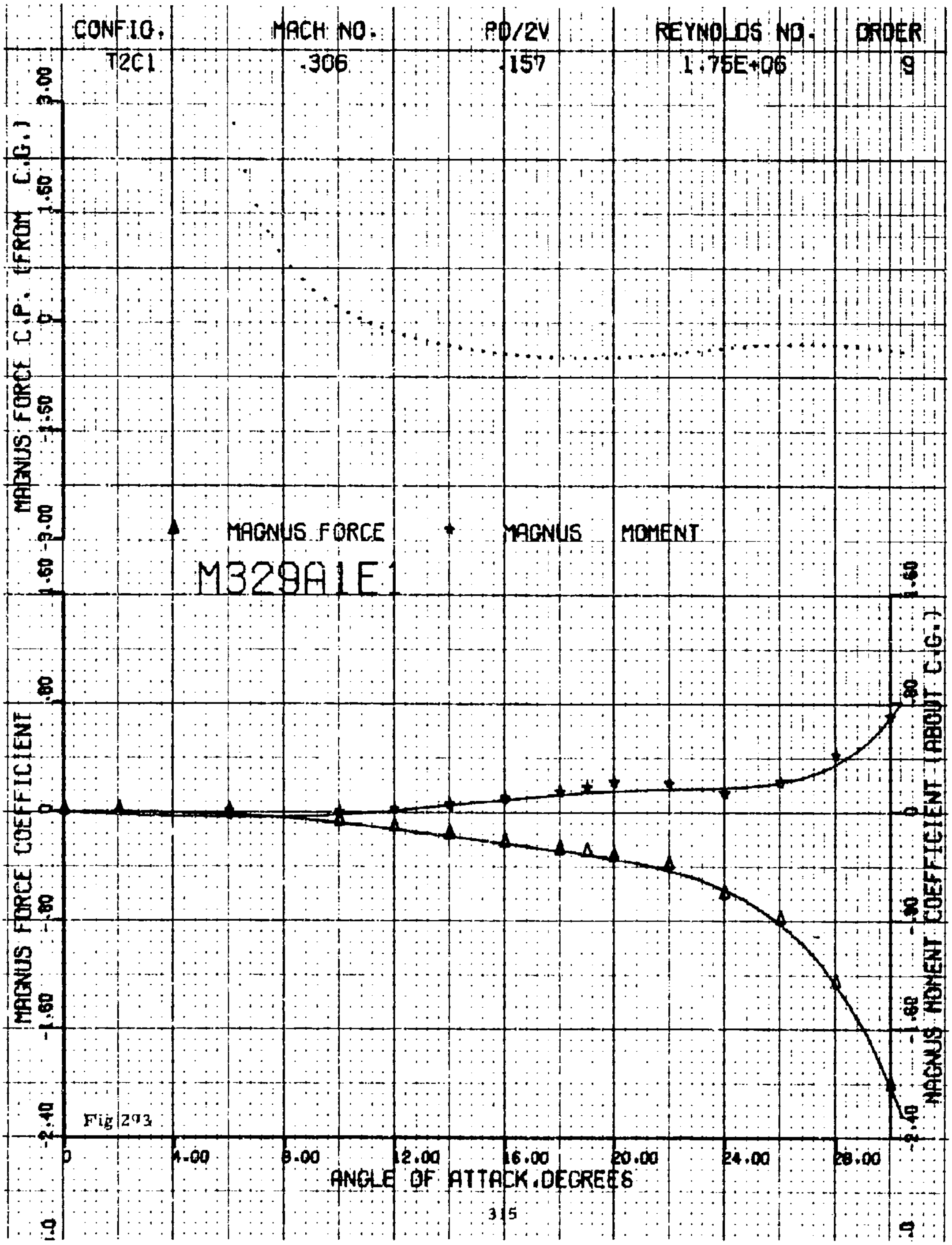
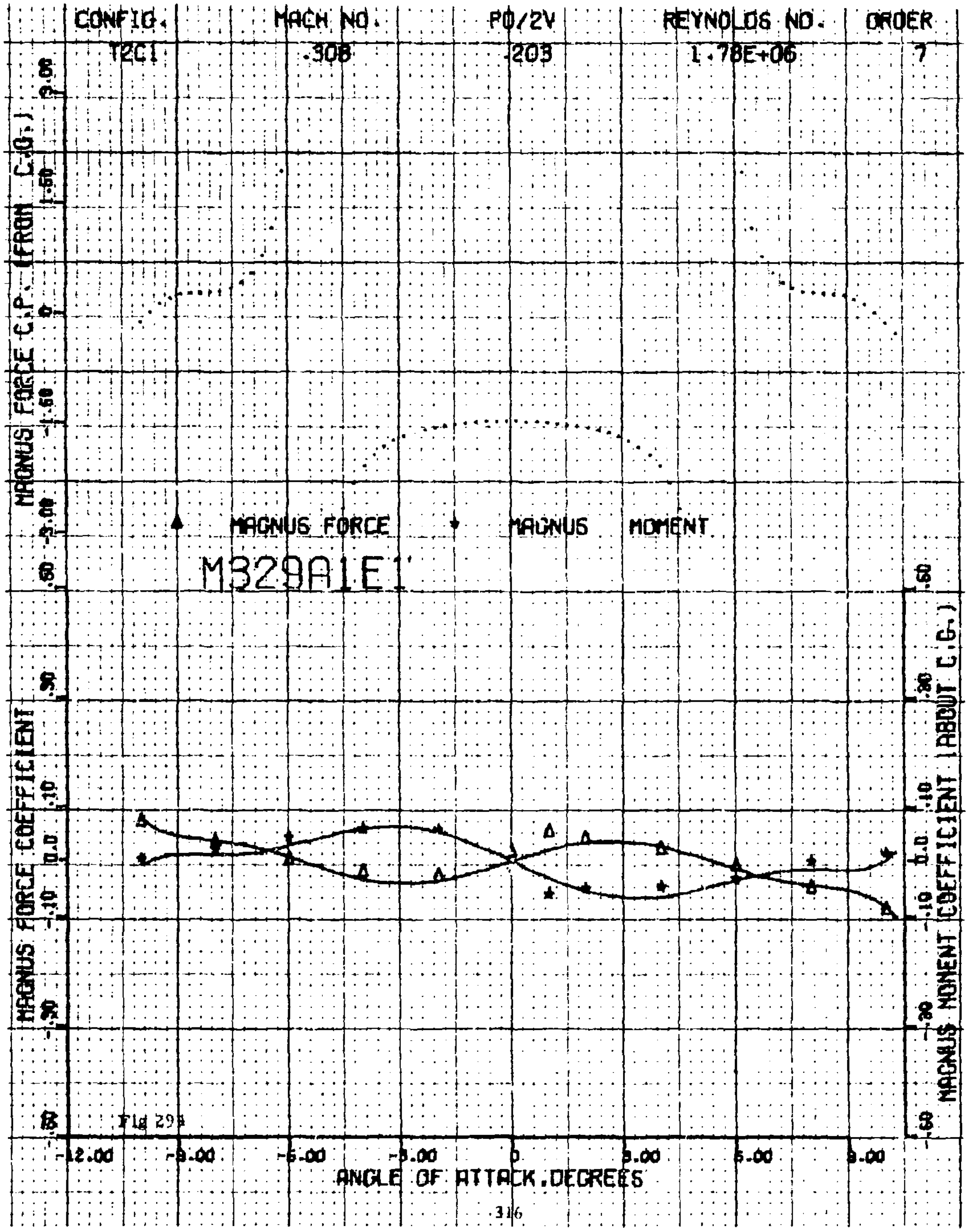
MAGNUS FORCE
MAGNUS MOMENT
M829A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 292



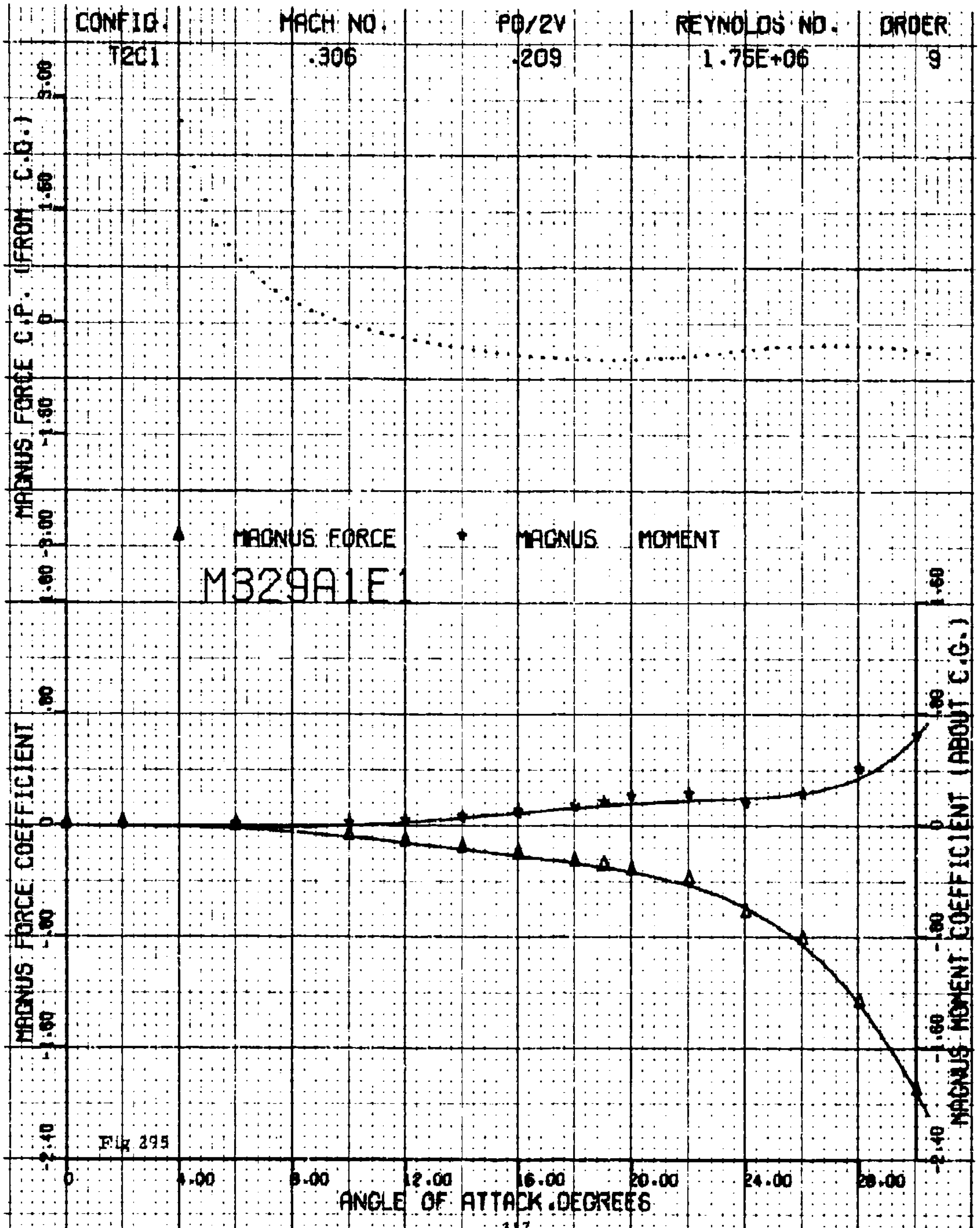
CONFIG.
T2C1
MACH NO.
.306
PD/2V
.157
REYNOLDS NO.
1.75E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 293



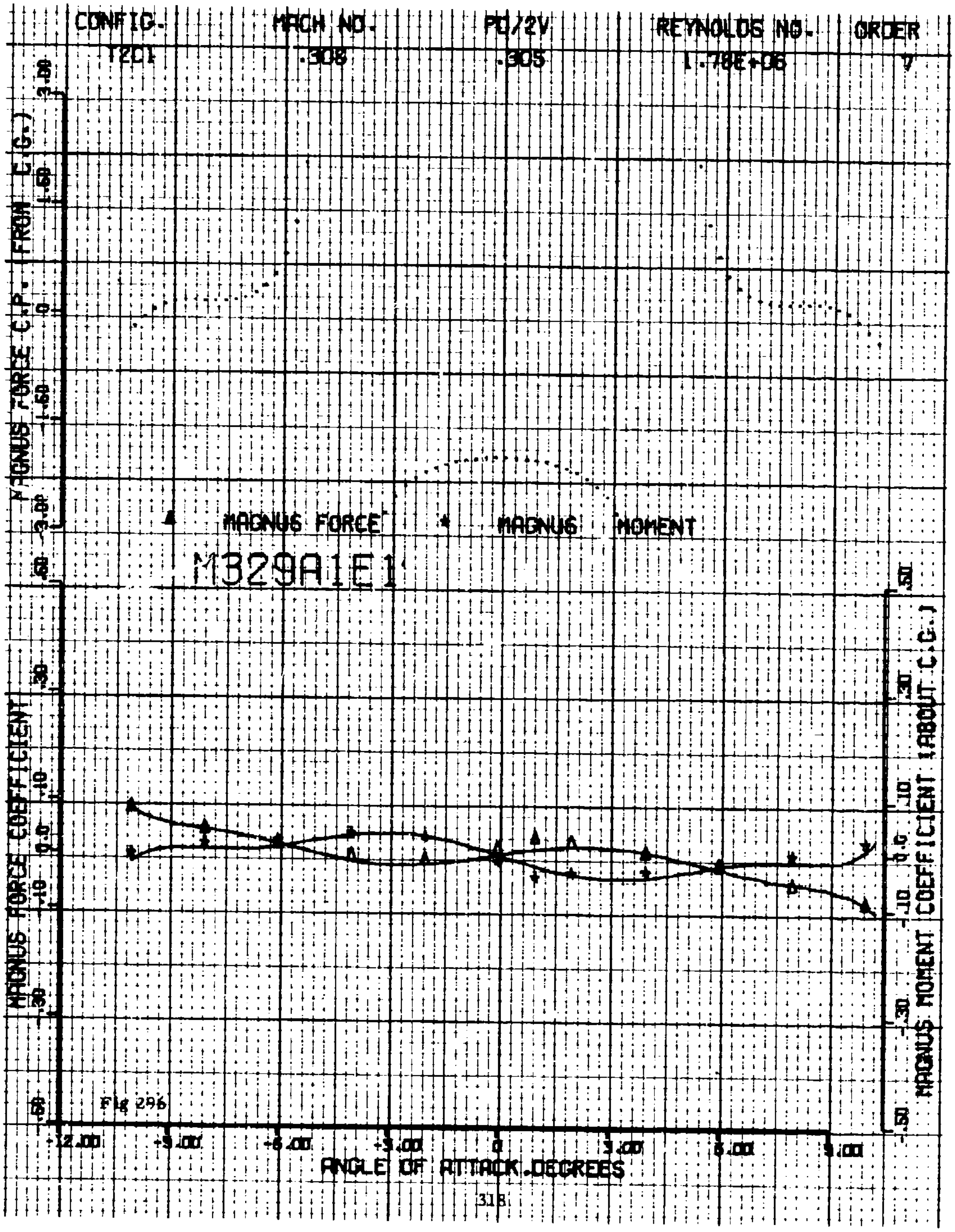
CONFIG.
T2C1
MACH NO.
.308
PD/2V
.203
REYNOLDS NO.
1.78E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00

Fig 29



CONFIG.
T2C1
MACH NO.
.306
PD/2V
.209
REYNOLDS NO.
1.75E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 295



CONFIG.
T2C1
MACH NO.
.308
PD/2V
.305
REYNOLDS NO.
1.78E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 296
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
ANGLE OF ATTACK,DEGREES

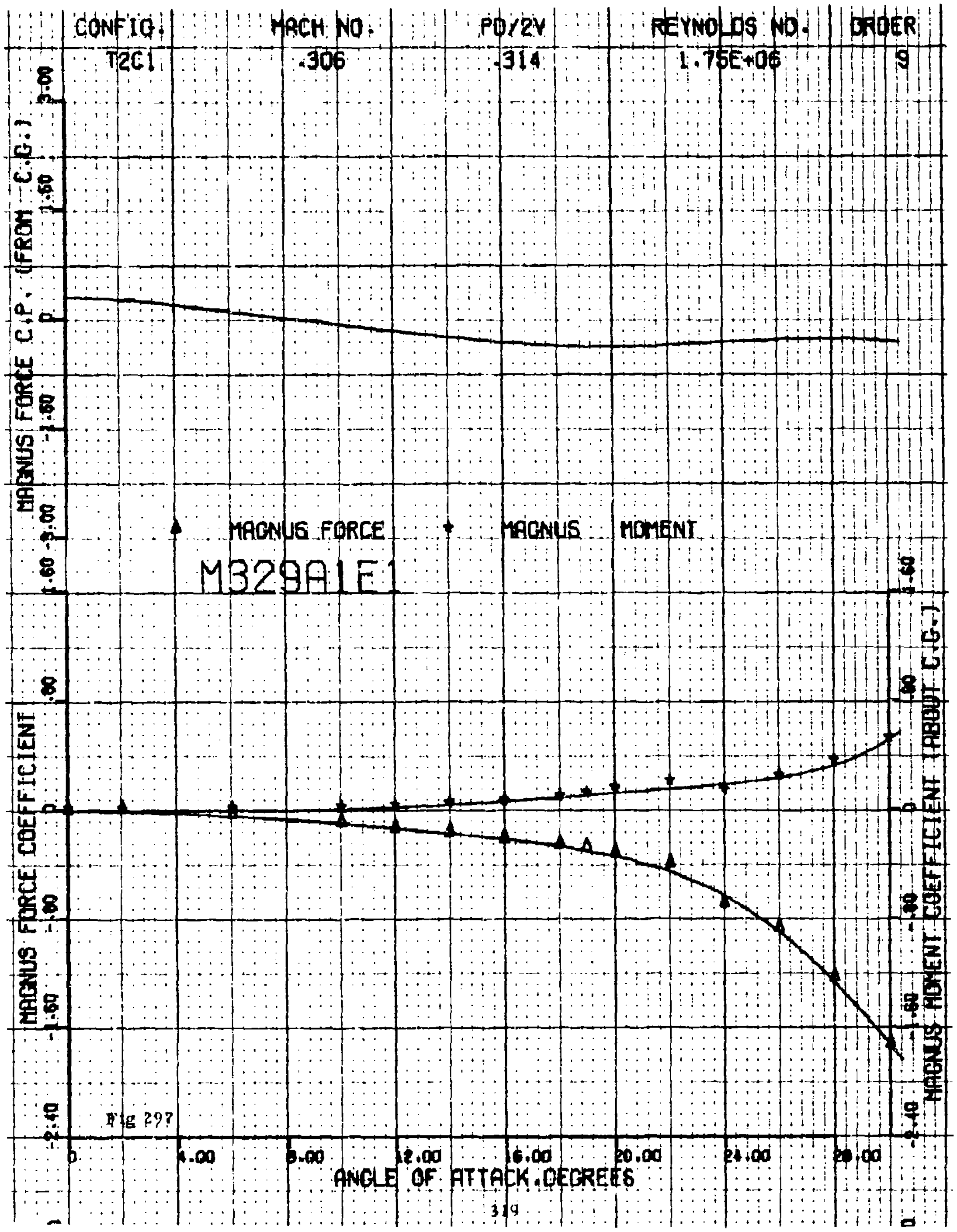
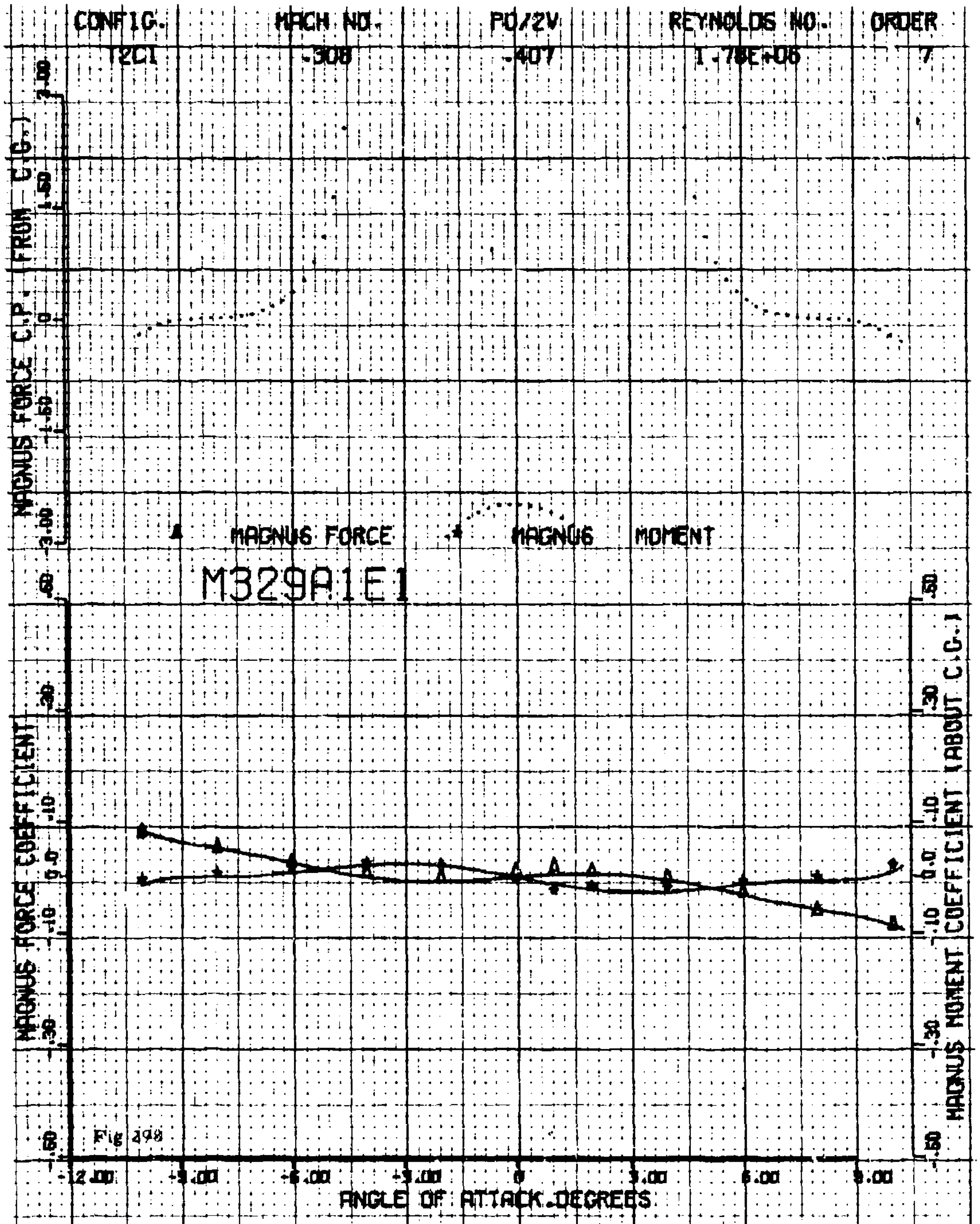
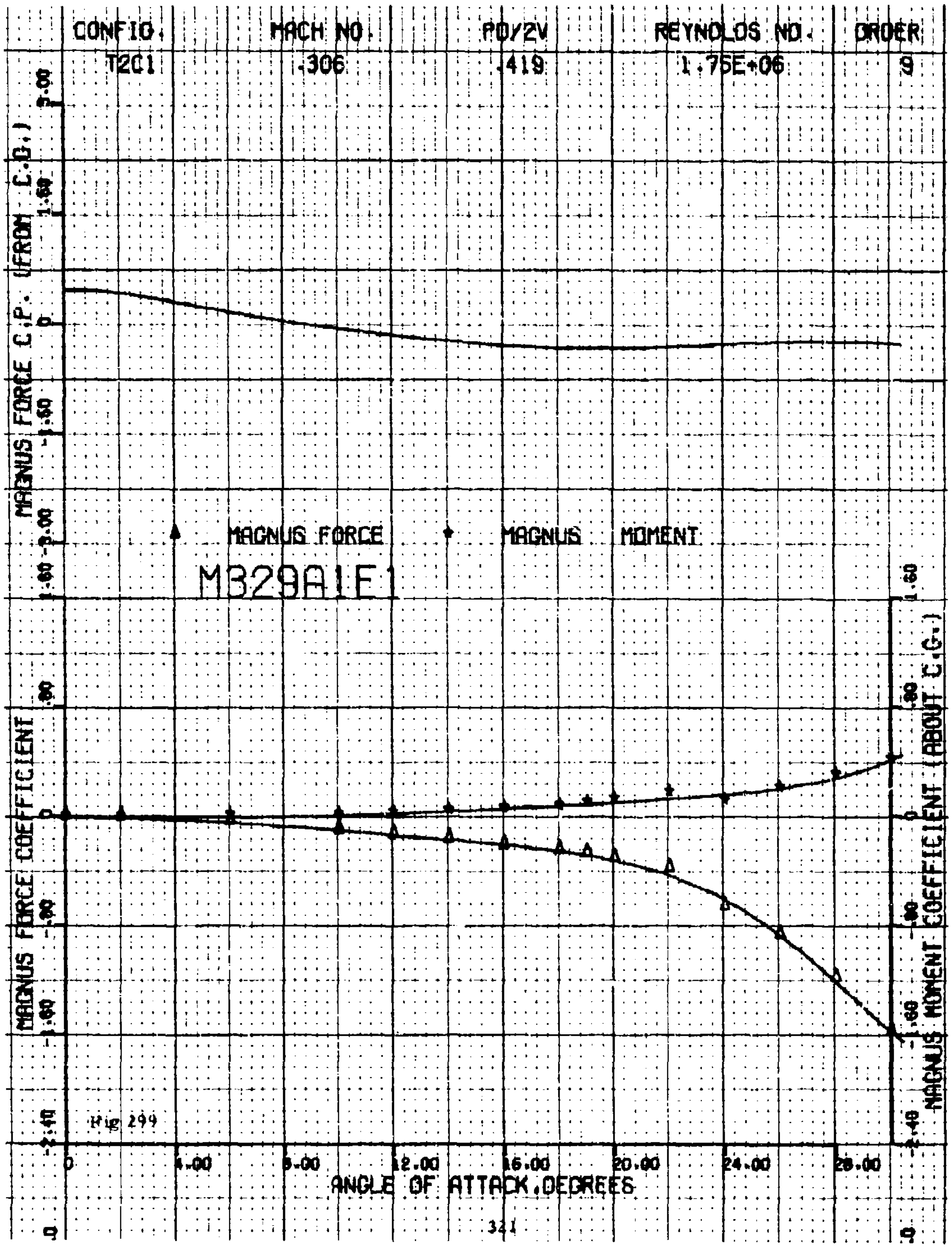

CONFIG. T2C1
MACH NO. .306
PD/2V .314
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00

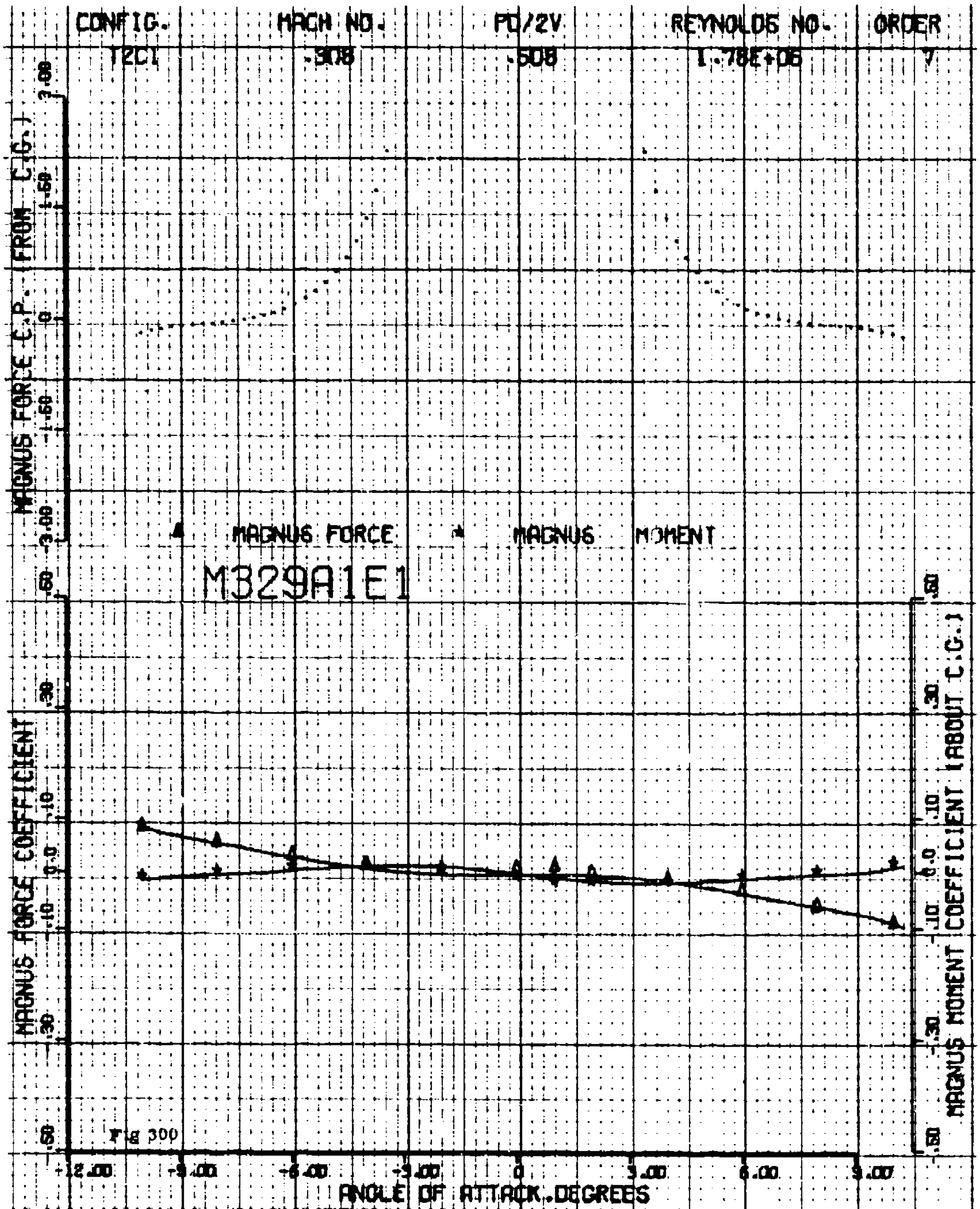
Fig 297


CONFIG. T2C1
MACH NO. .308
PD/2V .407
REYNOLDS NO. 1.78E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 198



CONFIG. T2C1
MACH NO. .306
PD/2V .419
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00

Fig 299


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.308
.508
1.78E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
Fig 300

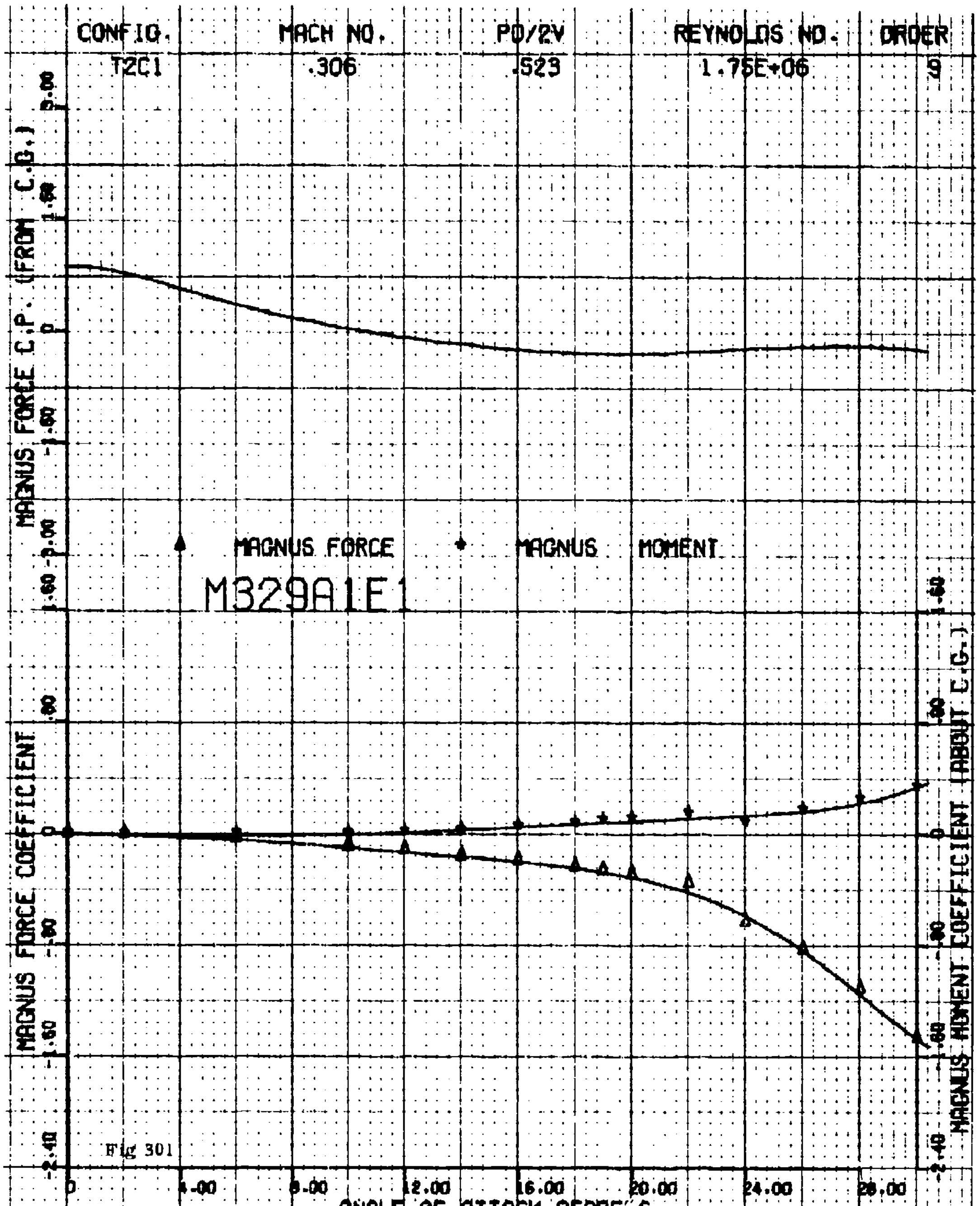
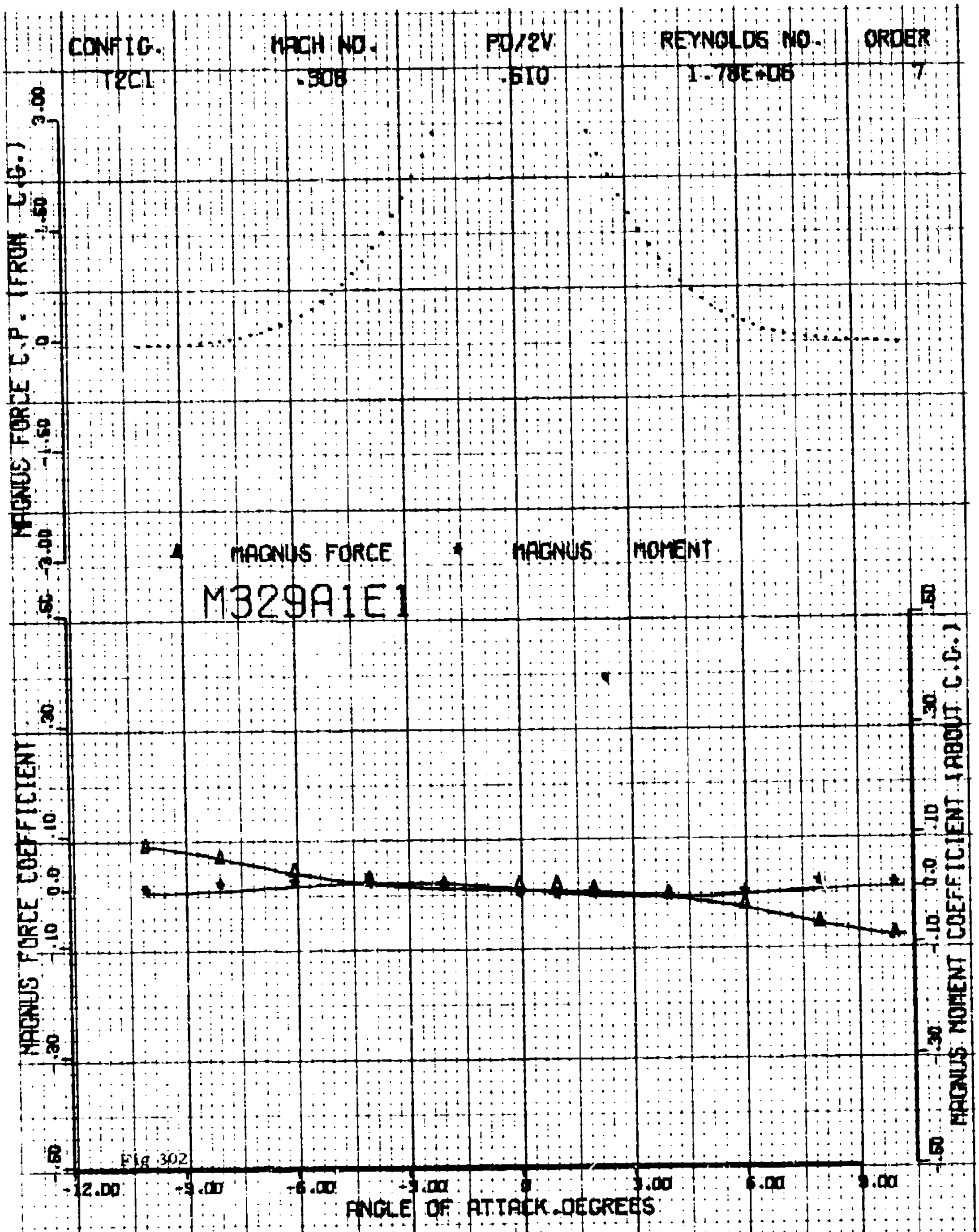
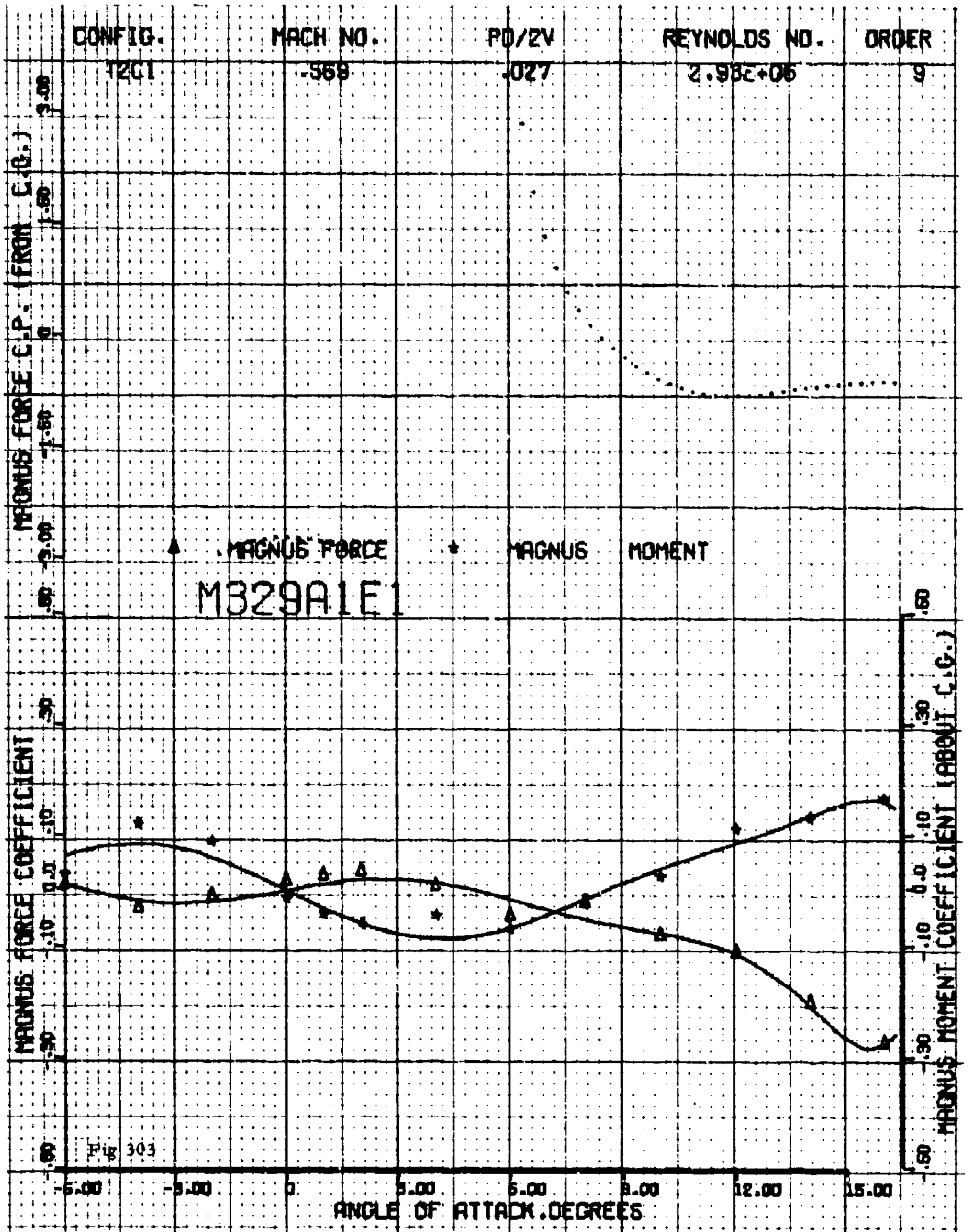

CONFIG. T2C1
MACH NO. .306
PD/2V .523
REYNOLDS NO. 1.75E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
0
4.00
8.00
12.00
16.00
20.00
24.00
28.00

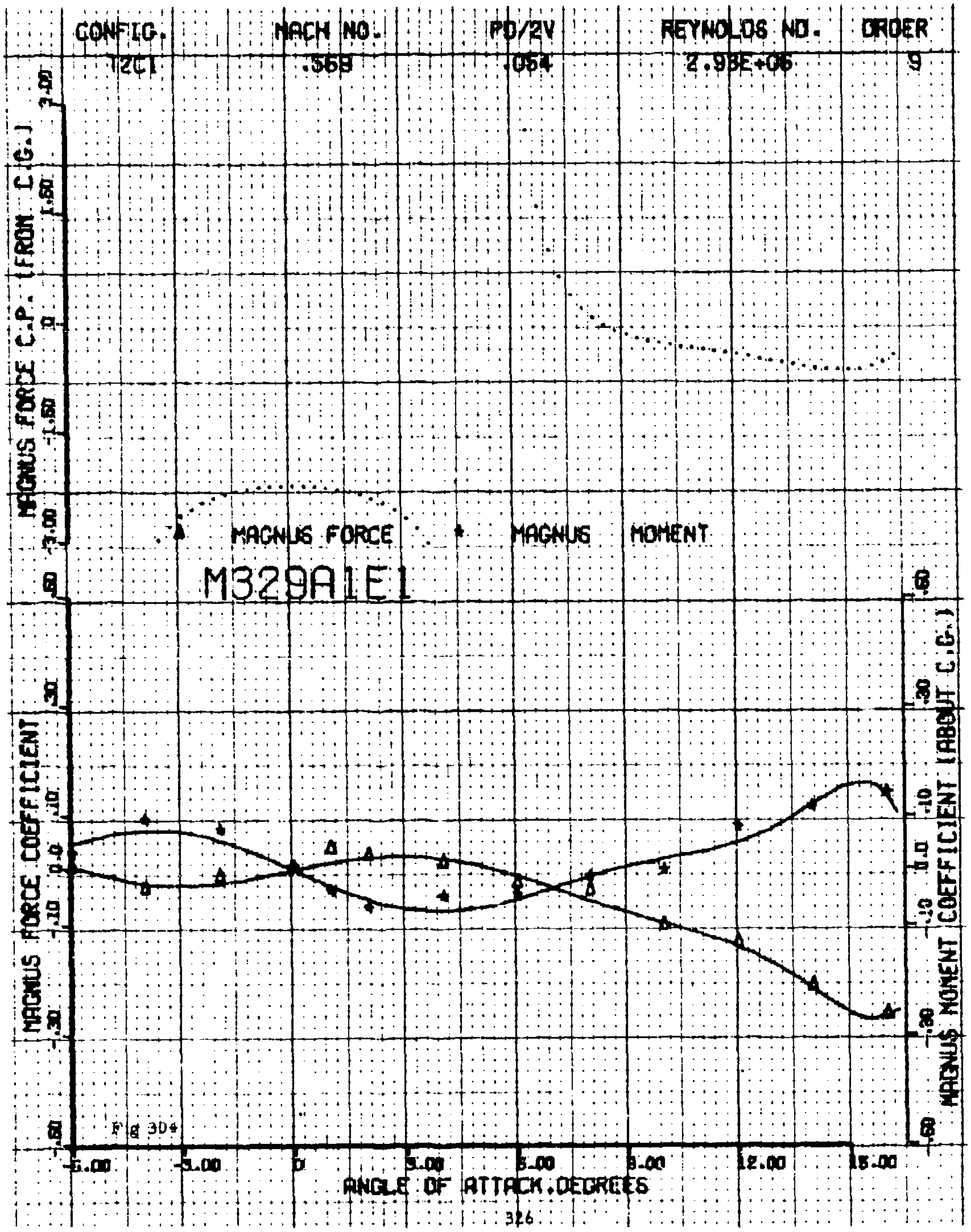
Fig 301



CONFIG.
T2C1
MACH NO.
.308
PD/2V
.610
REYNOLDS NO.
1.78E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
ANGLE OF ATTACK, DEGREES

Fig 302


CONFIG.
T2C1
MACH NO.
.569
PD/2V
.027
REYNOLDS NO.
2.93E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 303


CONFIG. T2C1
MACH NO. .568
PD/2V .054
REYNOLDS NO. 2.98E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 304

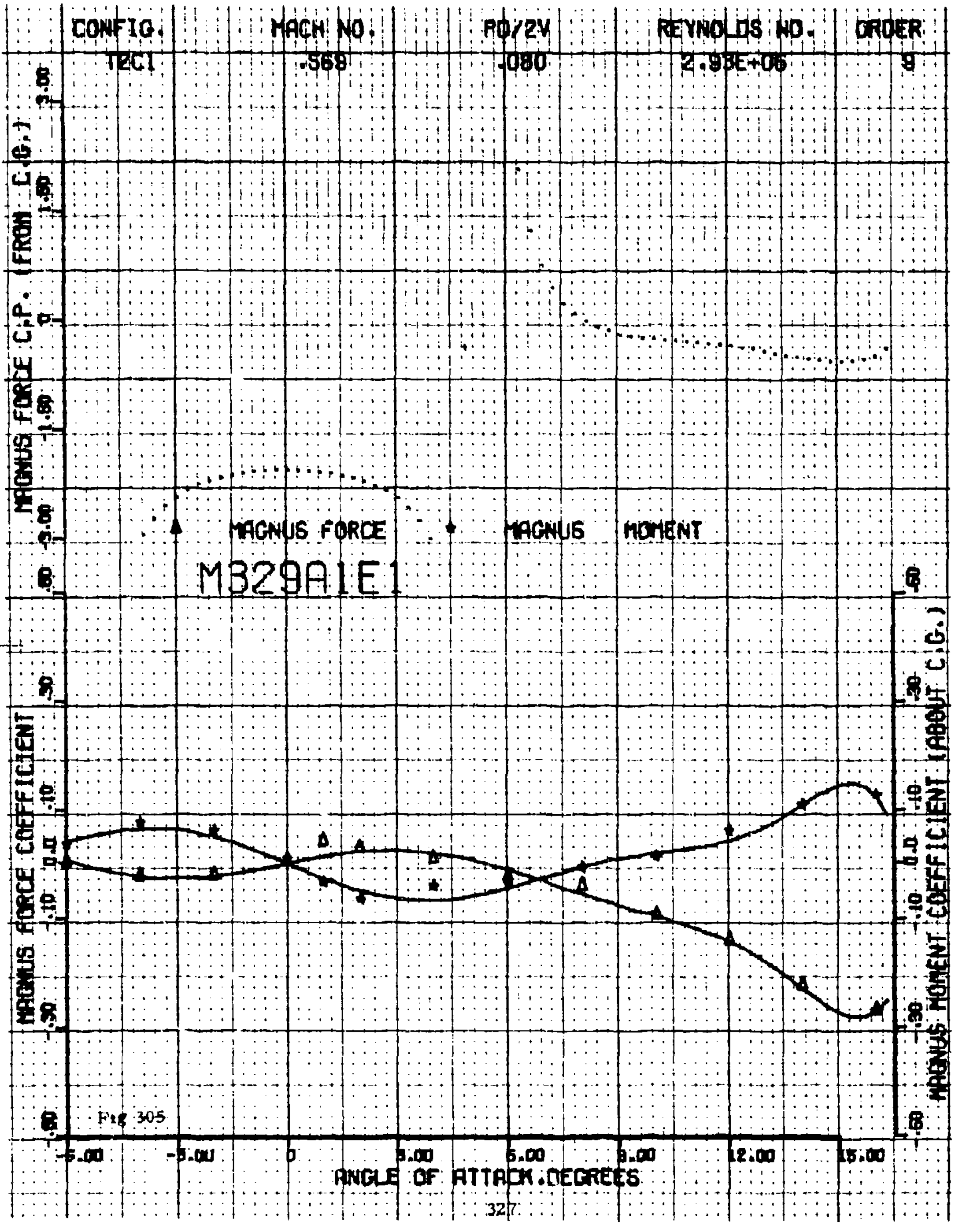
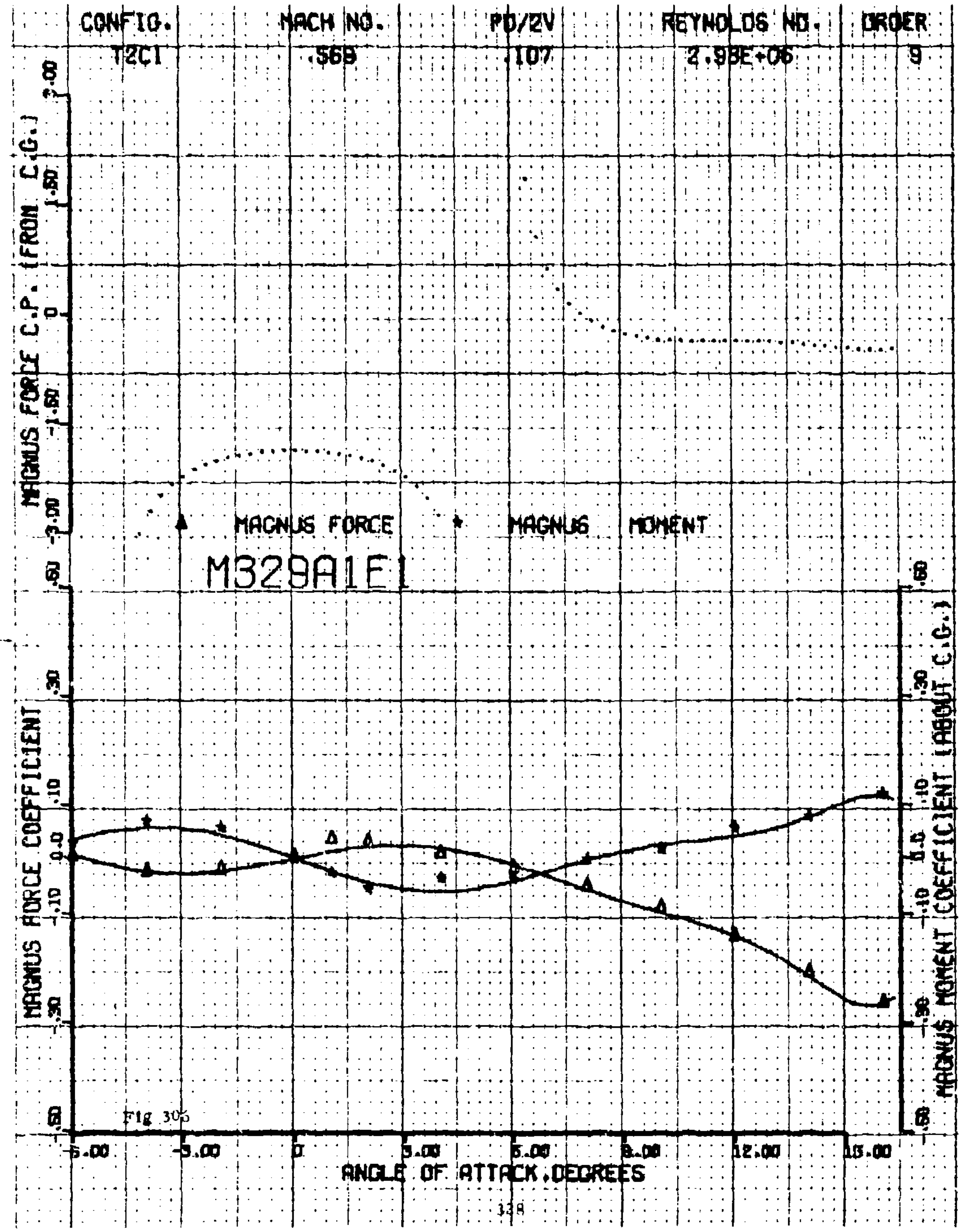

CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T2C1 .568 .080 2.93E+06 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 305


CONFIG. T2C1
MACH NO. .569
PD/2V .107
REYNOLDS NO. 2.98E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 305

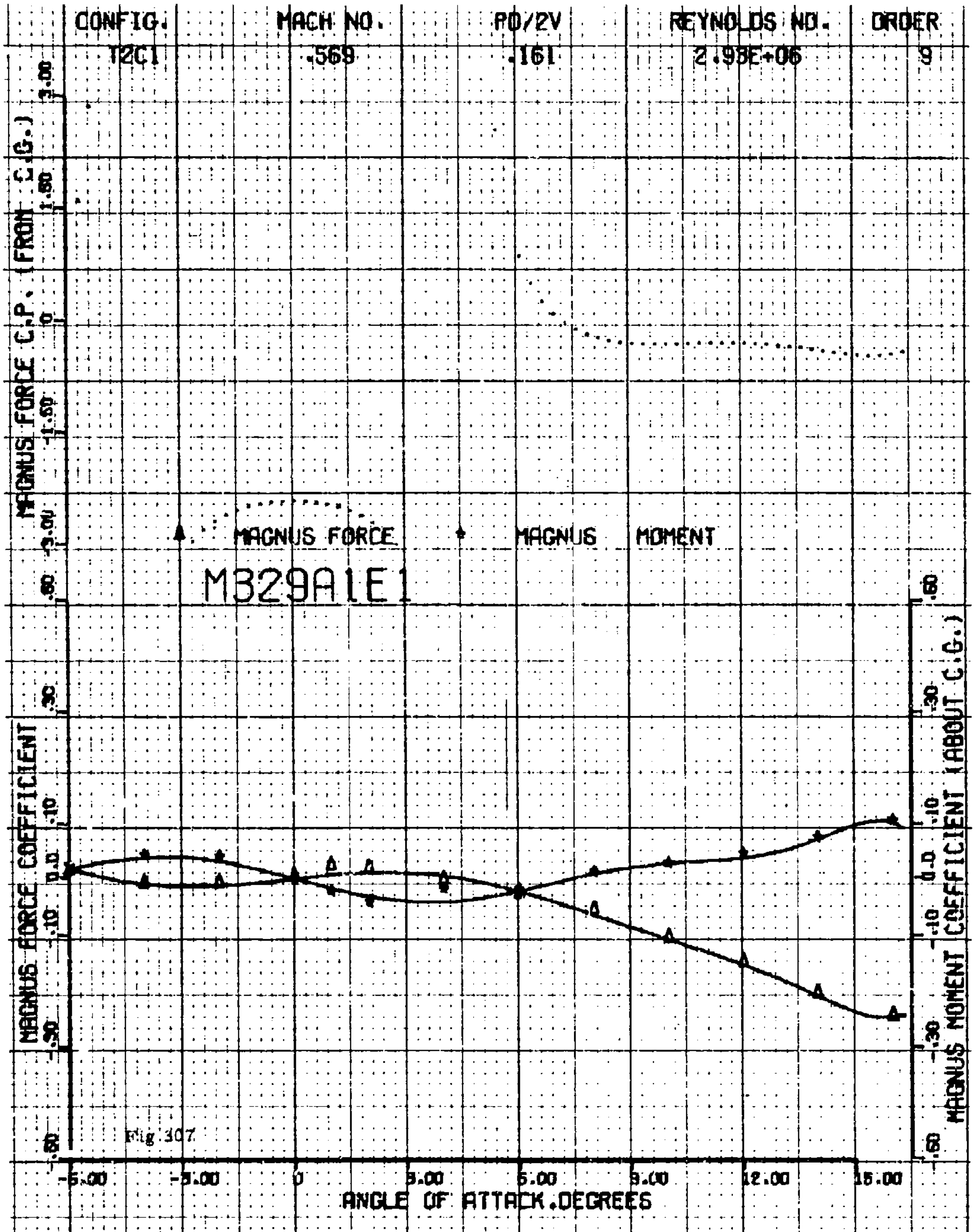
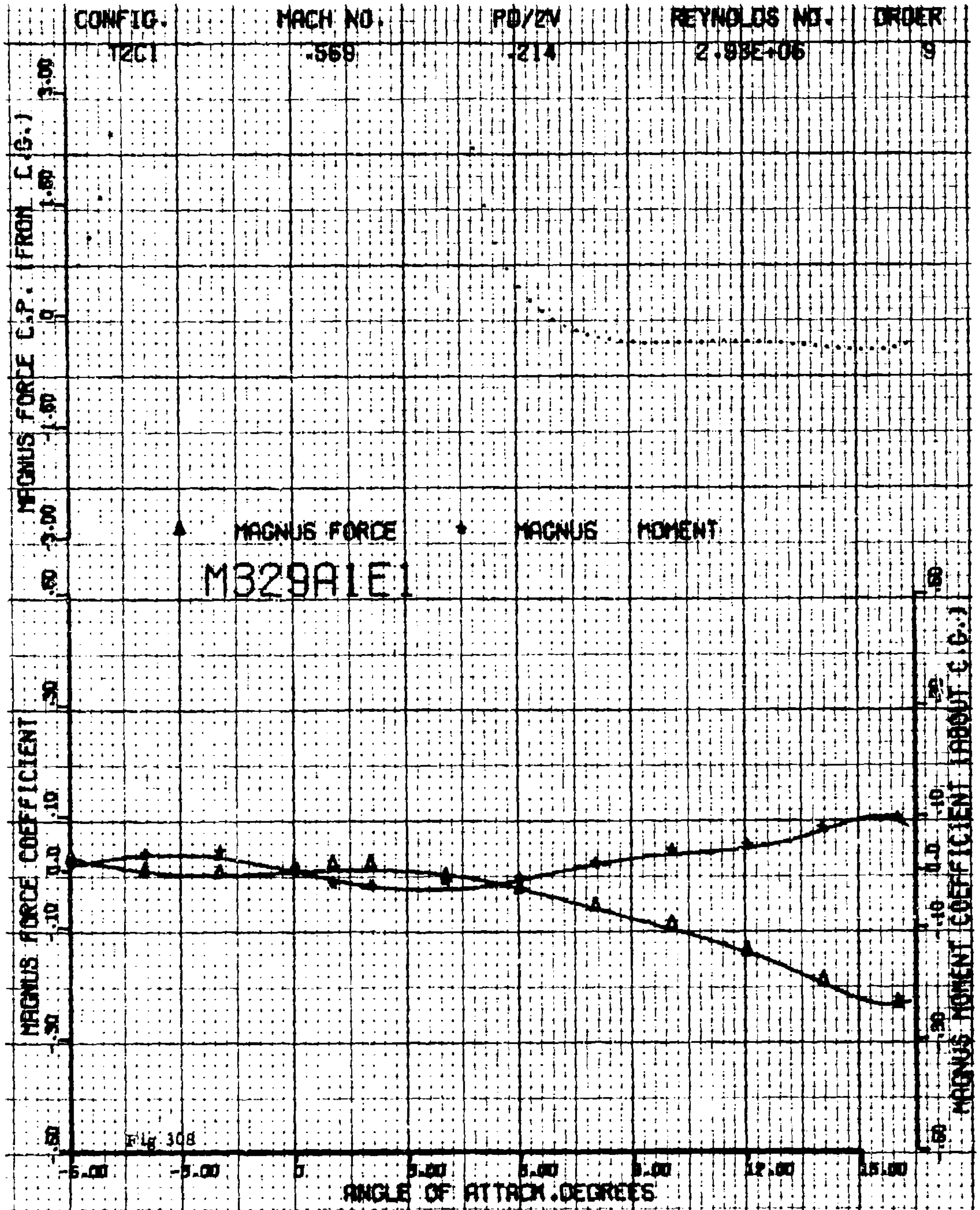
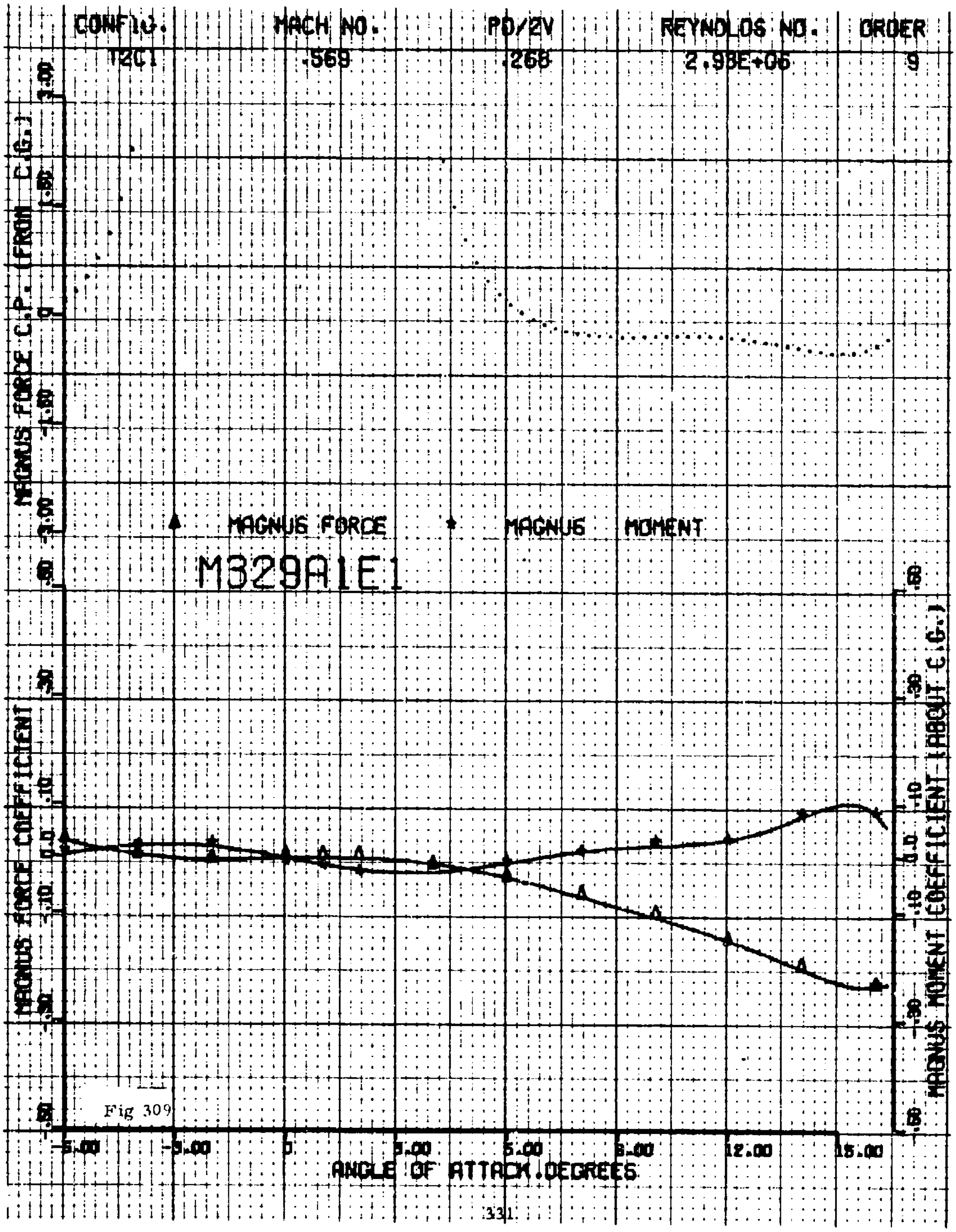
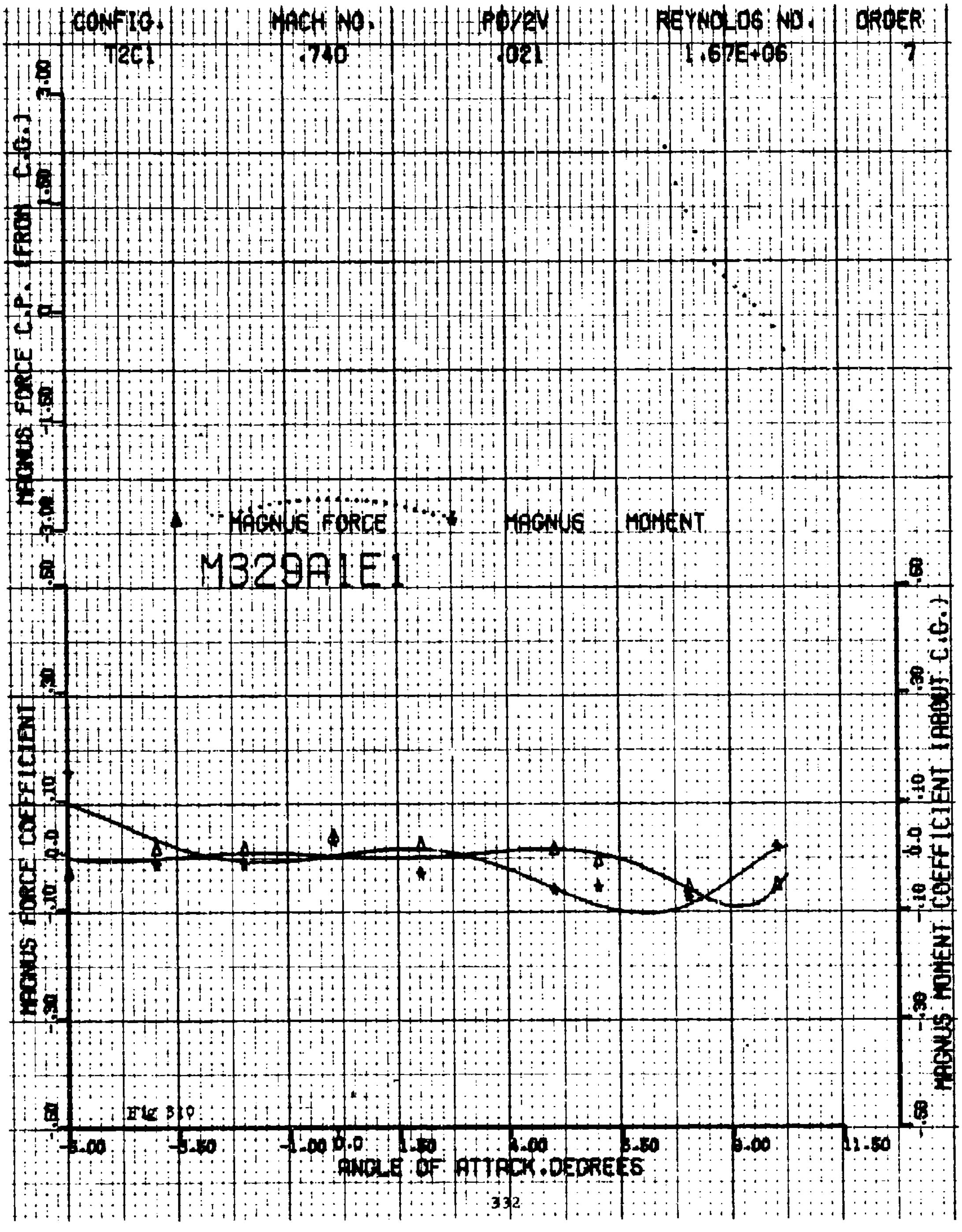
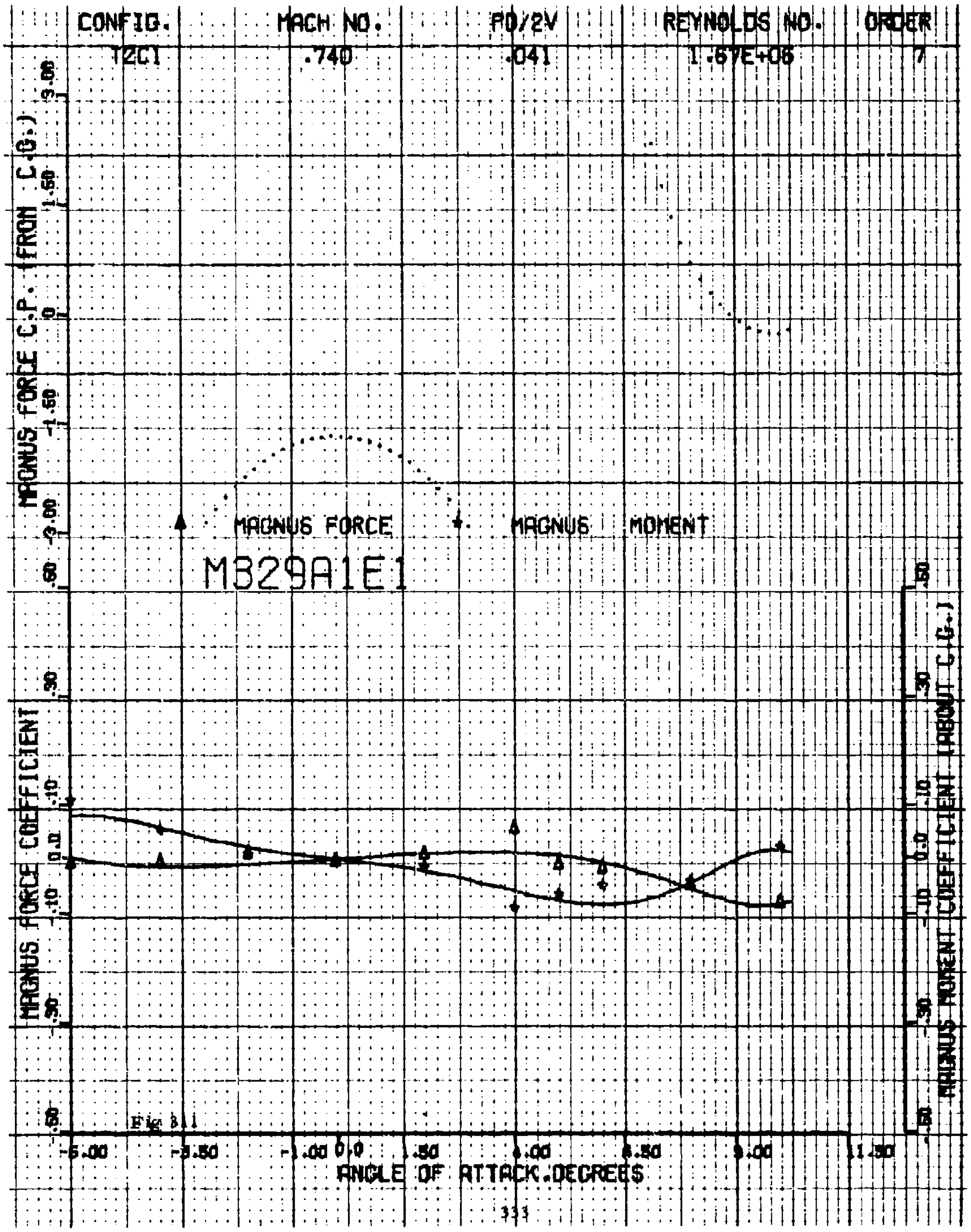

CONFIG.
T2C1
MACH NO.
.569
PD/2V
.161
REYNOLDS NO.
2.93E+06
ORDER
9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00

Fig 307


CONFIG. T2C1
MACH NO. .569
PD/2V .214
REYNOLDS NO. 2.93E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 308
ANGLE OF ATTACK,DEGREES


CONFIG. T2C1
MACH NO. .569
PD/2V .268
REYNOLDS NO. 2.93E+06
ORDER 9
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 309


CONFIG. T2C1
MACH NO. .740
PD/2V .021
REYNOLDS NO. 1.67E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
Fig 310


CONFIG. T2C1
MACH NO. .740
PD/2V .041
REYNOLDS NO. 1.67E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 3.11

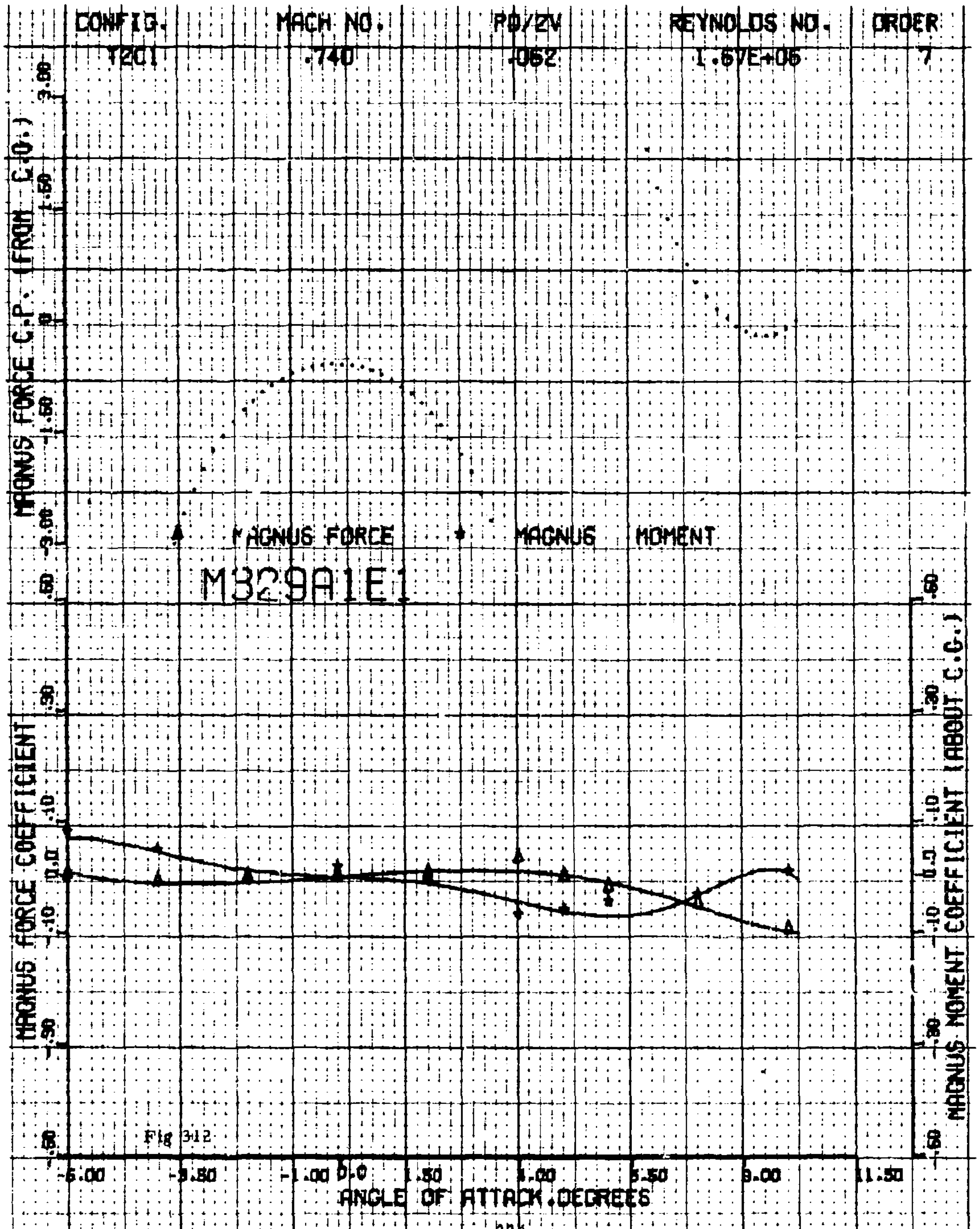

CONFIG.
T201
MACH NO.
.740
PD/2V
.062
REYNOLDS NO.
1.67E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 312

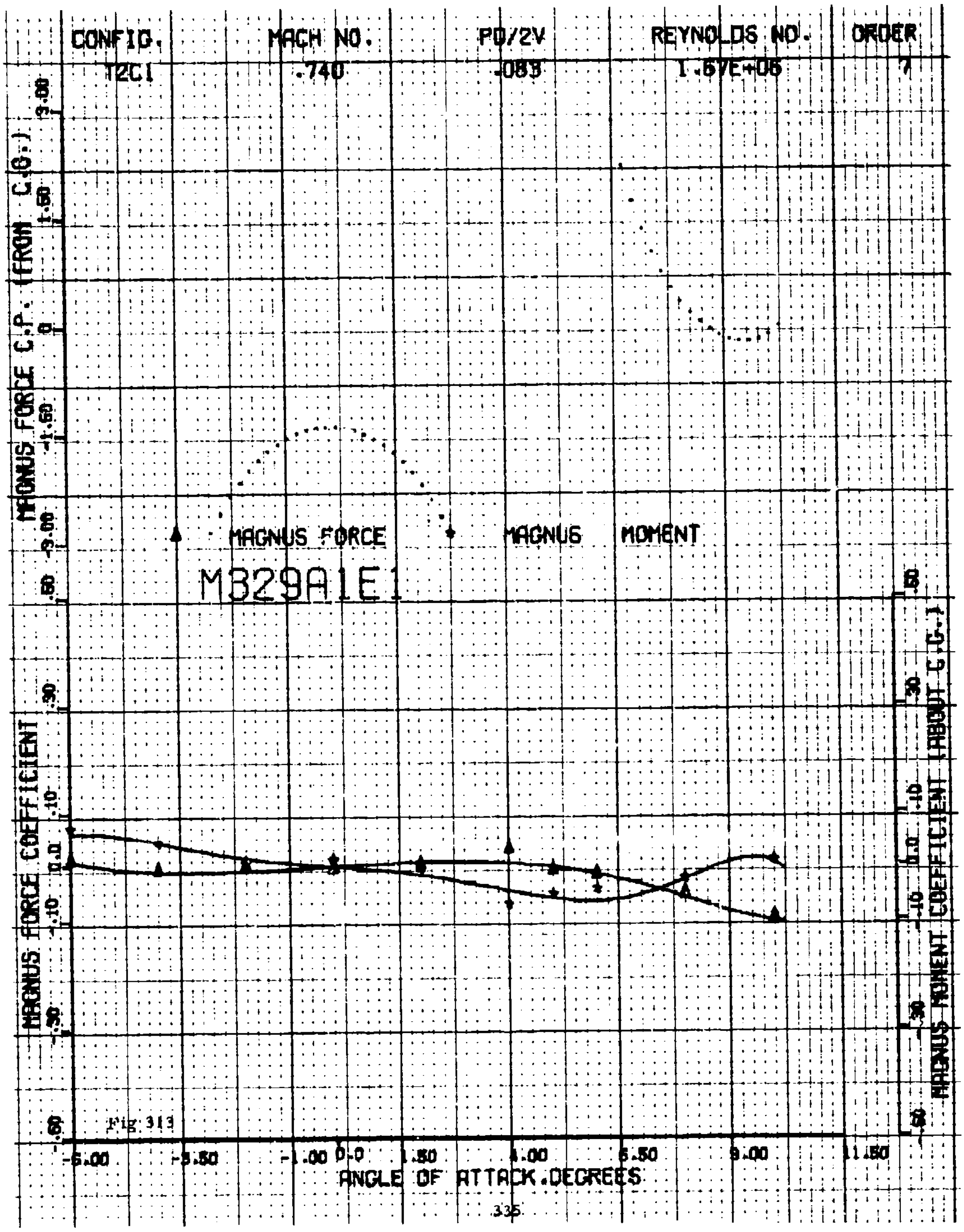
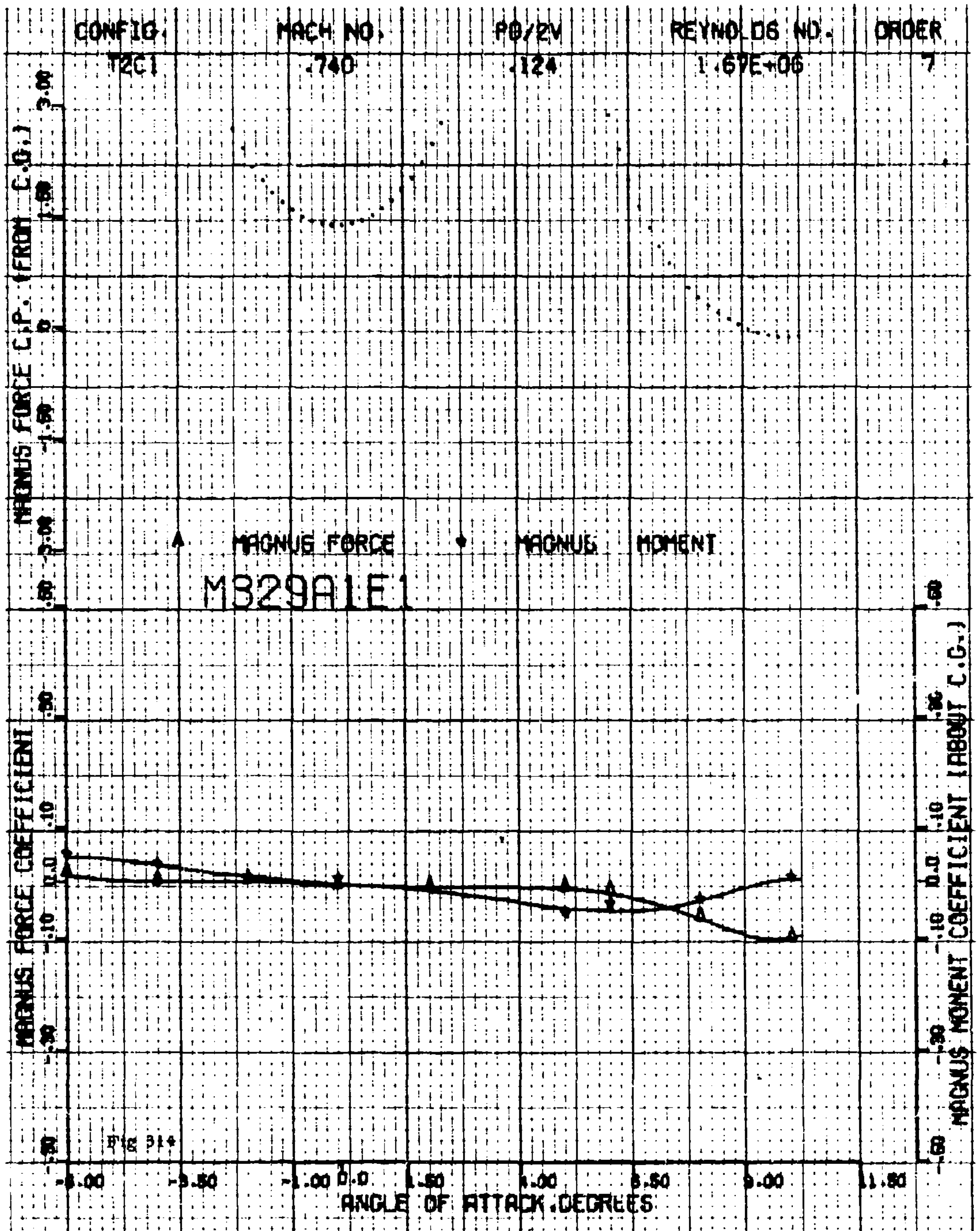
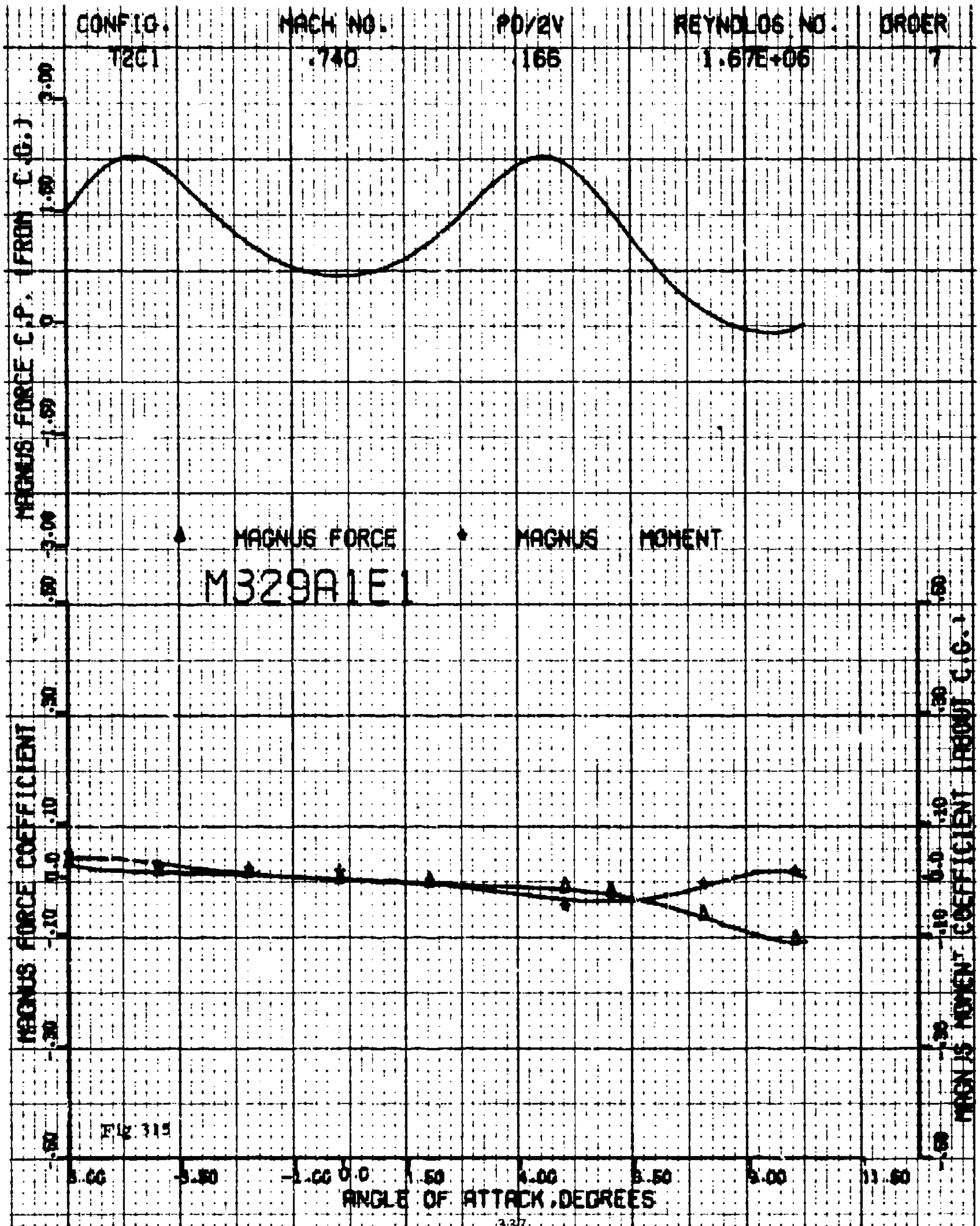
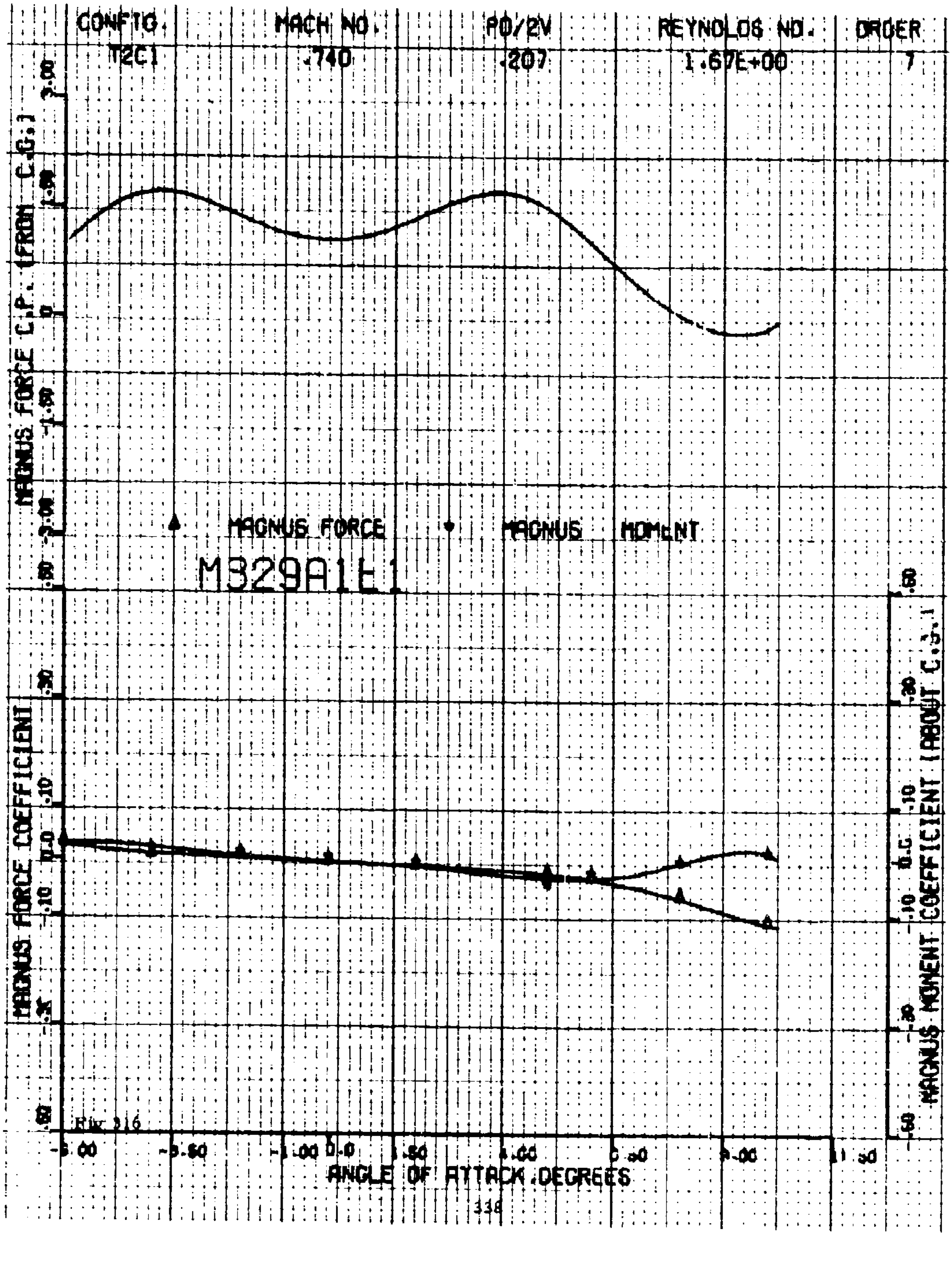

CONFIG. T2C1
MACH NO. .740
PD/2V .083
REYNOLDS NO. 1.67E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 313



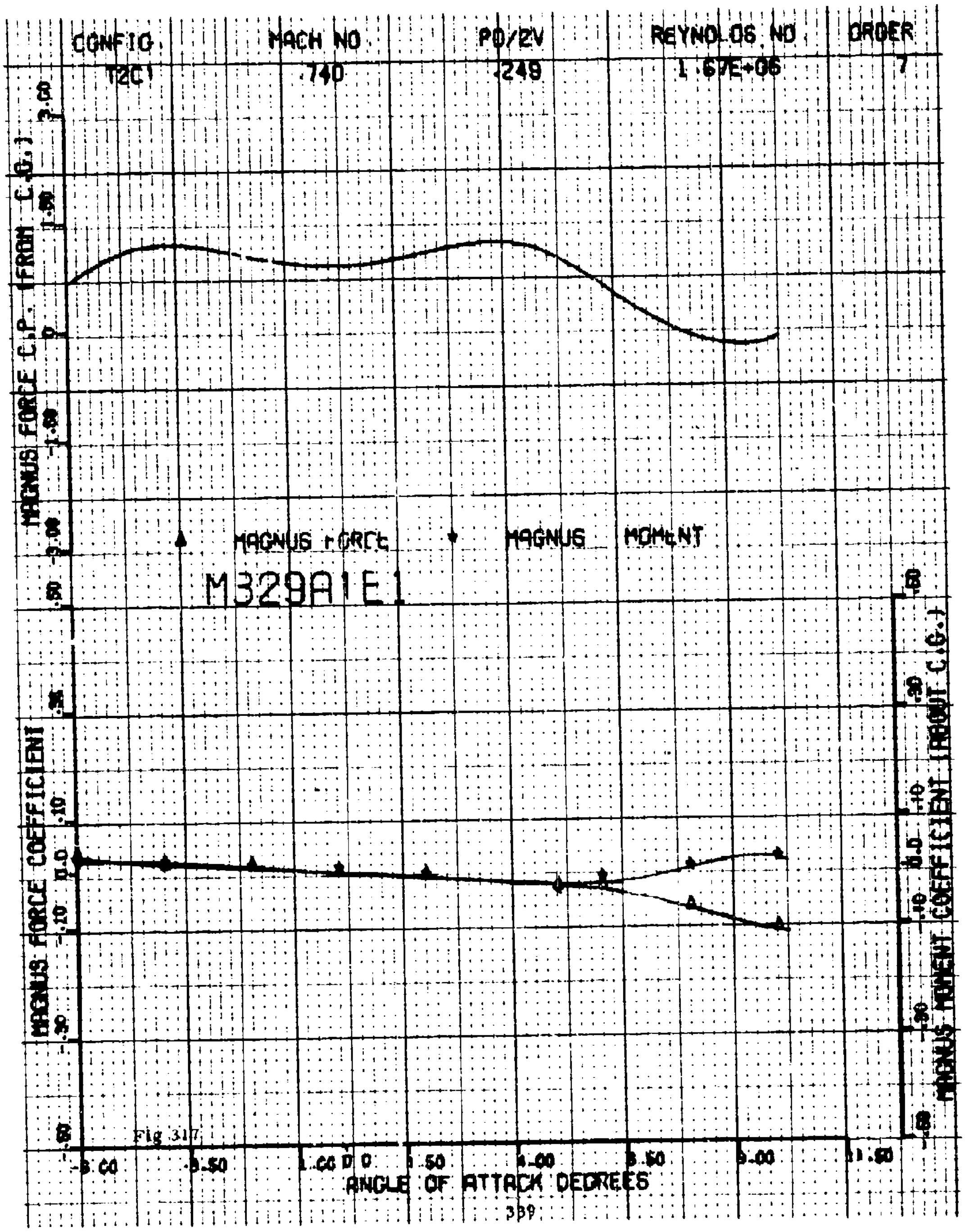
CONFIG. T2C1
MACH NO. .740
PD/2V .124
REYNOLDS NO. 1.67E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 314


CONFIG. T2C1
MACH NO. .740
PD/2V .166
REYNOLDS NO. 1.67E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 315
ANGLE OF ATTACK, DEGREES



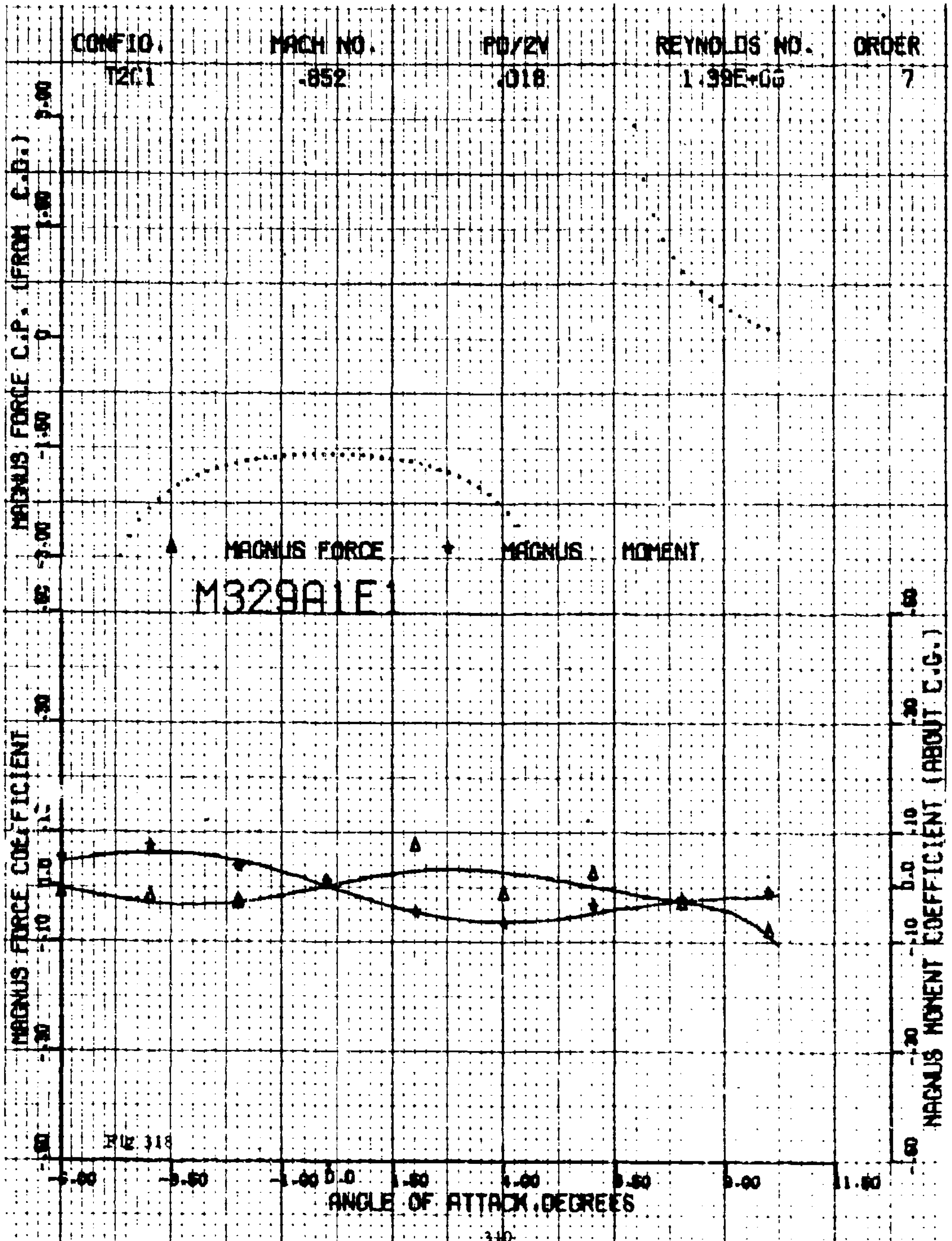
CONFIG.
T2C1
MACH NO.
.740
PD/2V
.207
REYNOLDS NO.
1.67E+00
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig. 316

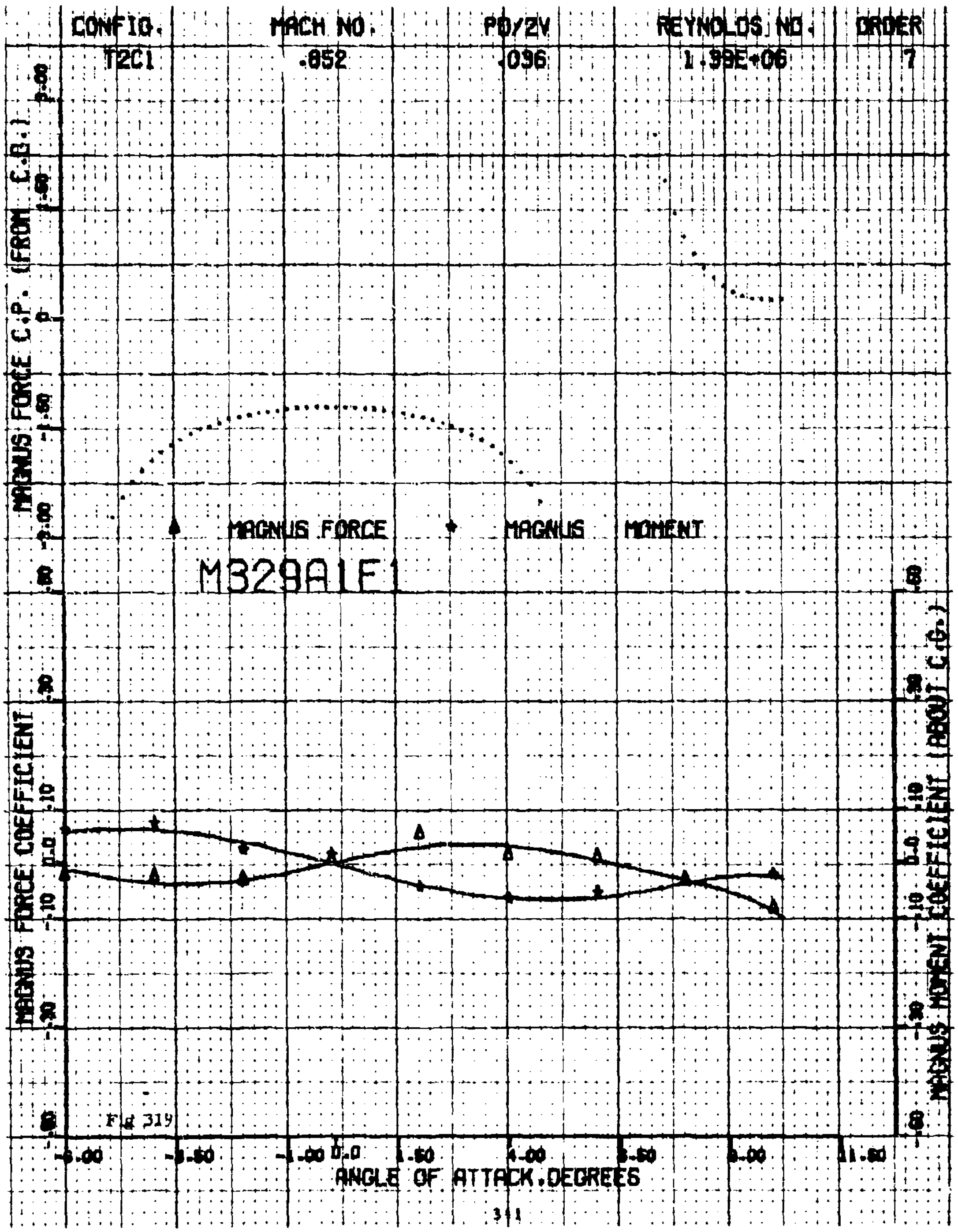


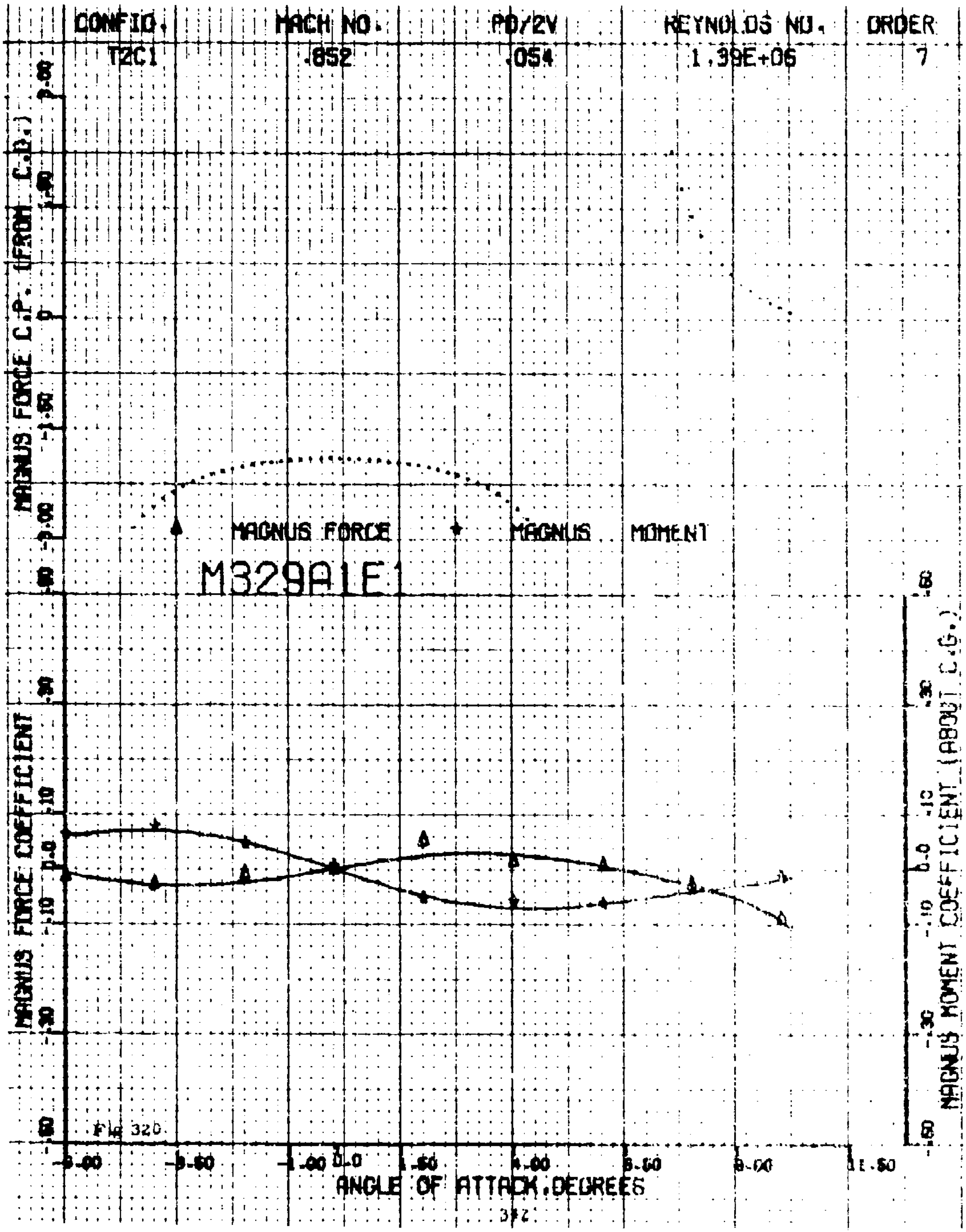
CONFIG
T2C1
MACH NO
.740
PD/2V
.249
REYNOLDS NO
1.67E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK DEGREES

Fig 317



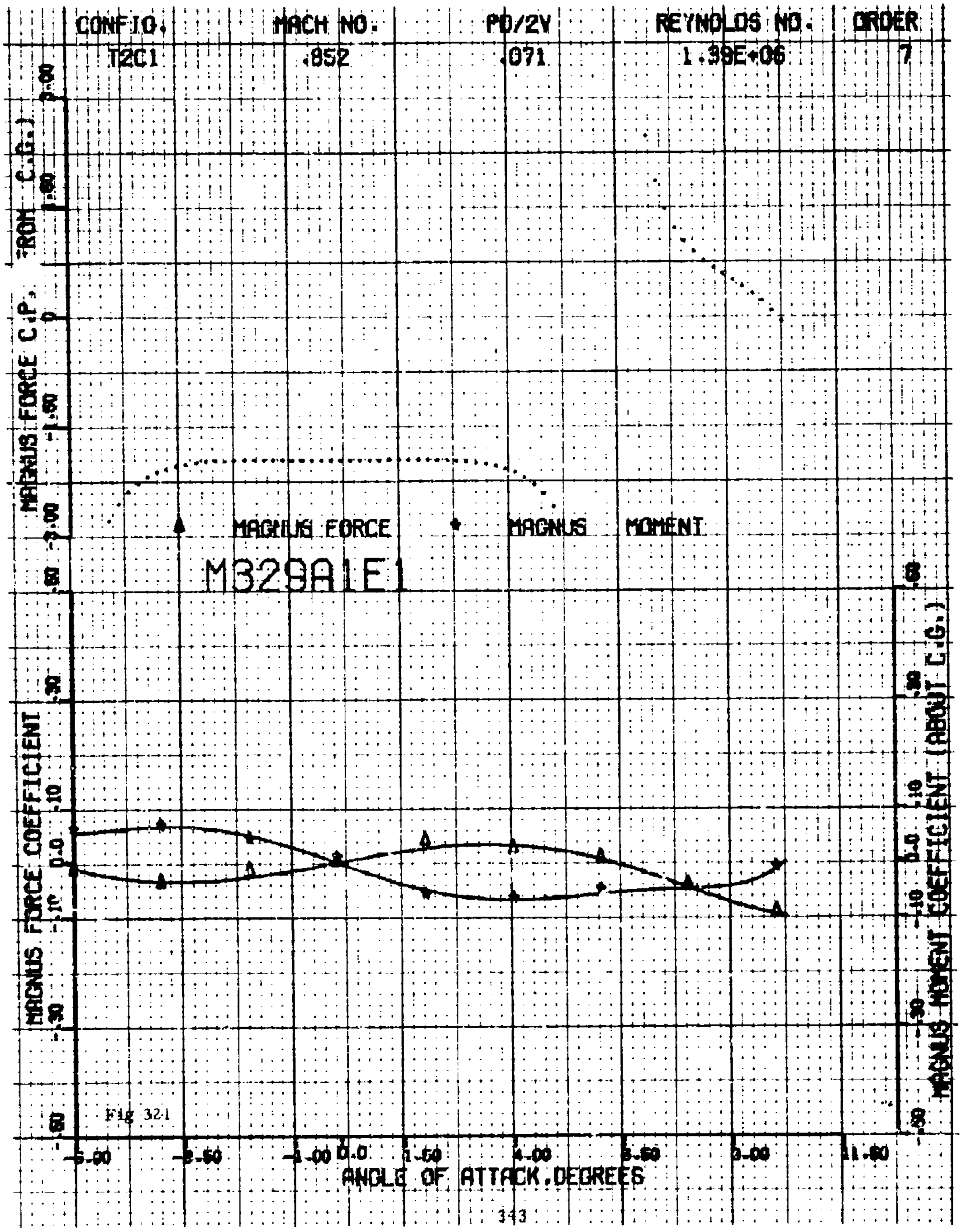
CONFIG.
T2C1
MACH NO.
.852
PD/2V
.018
REYNOLDS NO.
1.39E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES


CONFIG. T2C1
MACH NO. .852
PD/2V .036
REYNOLDS NO. 1.39E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
Fig 319



CONFIG. T2C1
MACH NO. .852
PD/2V .054
REYNOLDS NO. 1.39E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
ANGLE OF ATTACK, DEGREES

Fig 320


CONFIG. T2C1
MACH NO. .852
PD/2V .071
REYNOLDS NO. 1.39E+06
ORDER 7
MAGNUS FORCE C.P. FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 321

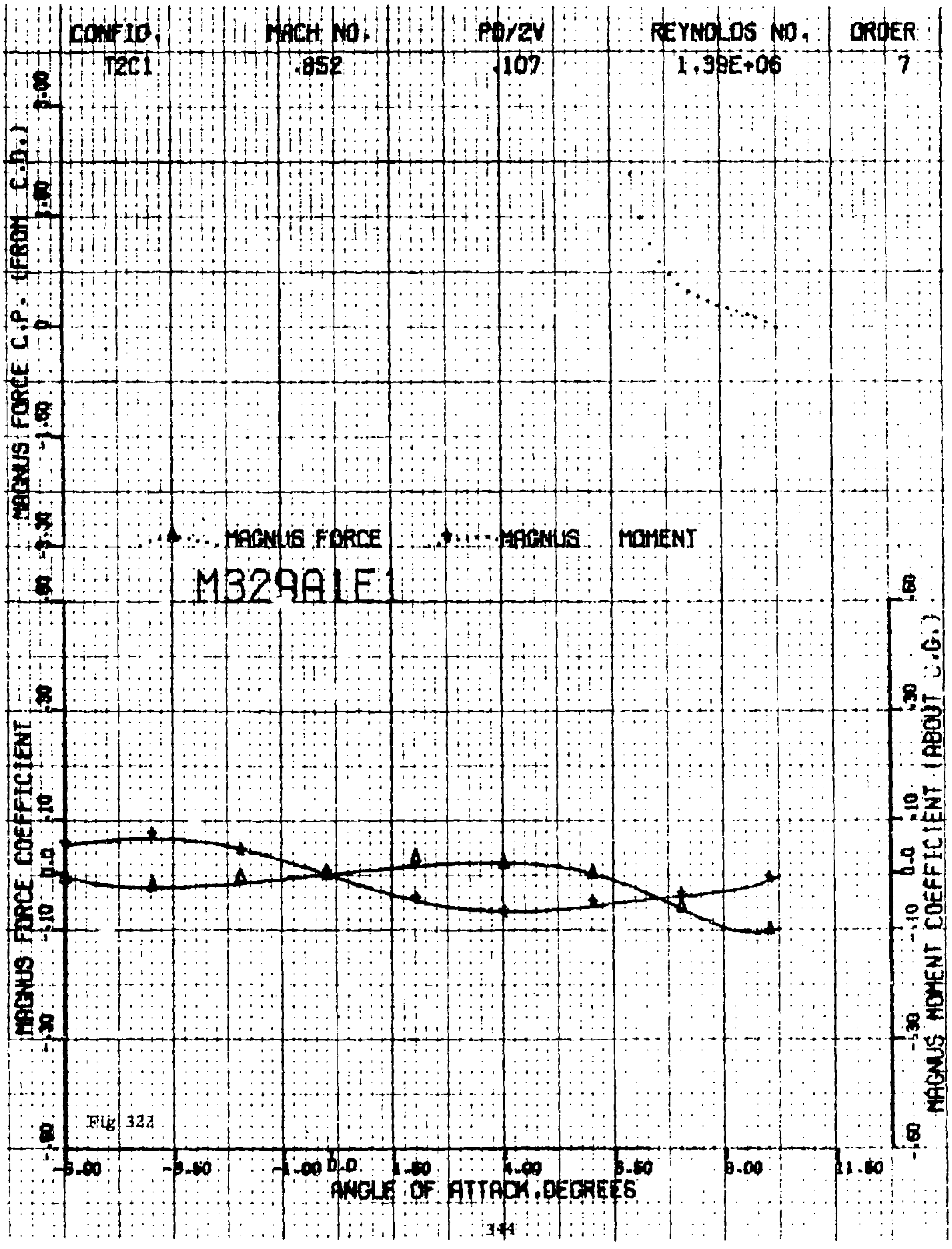
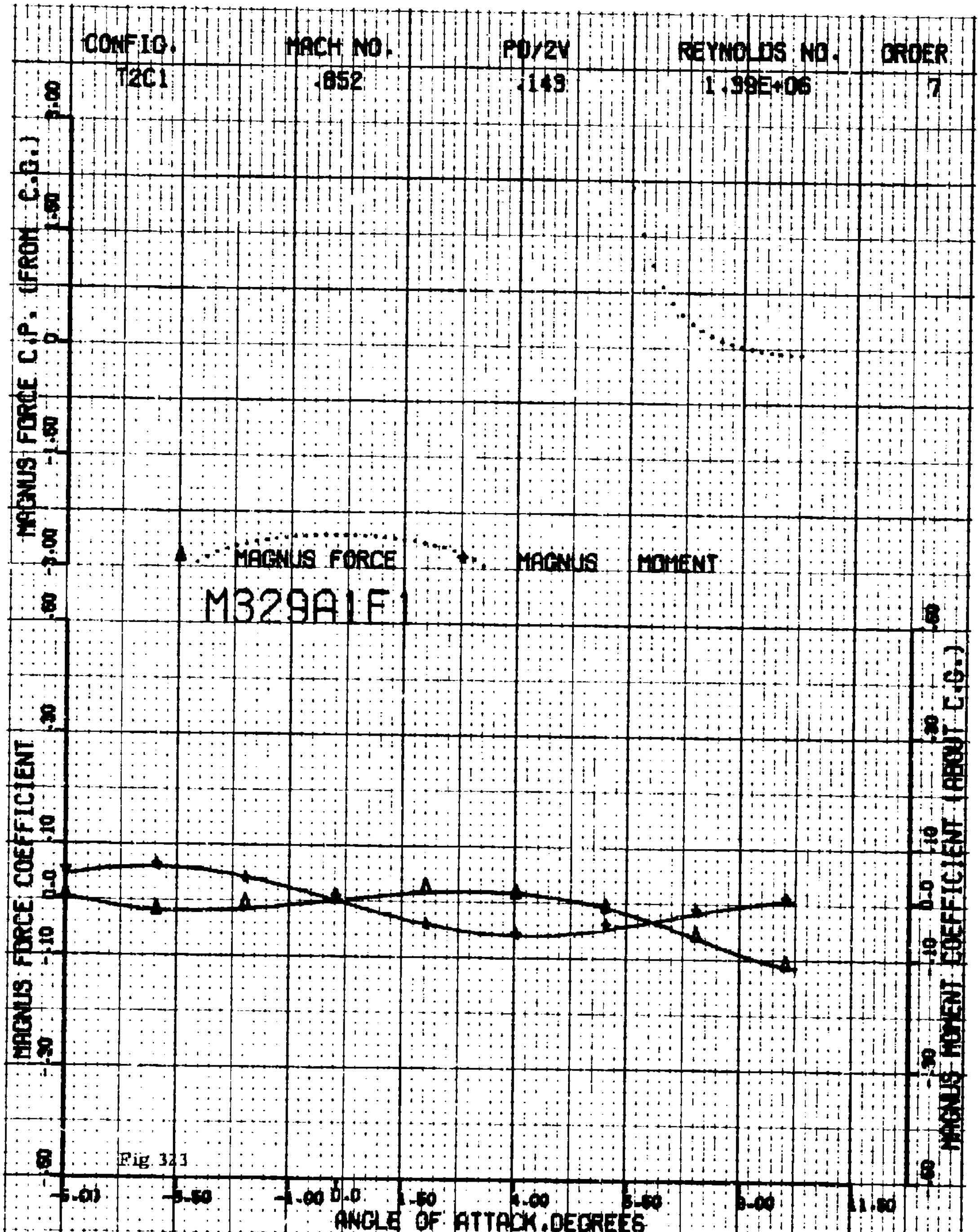
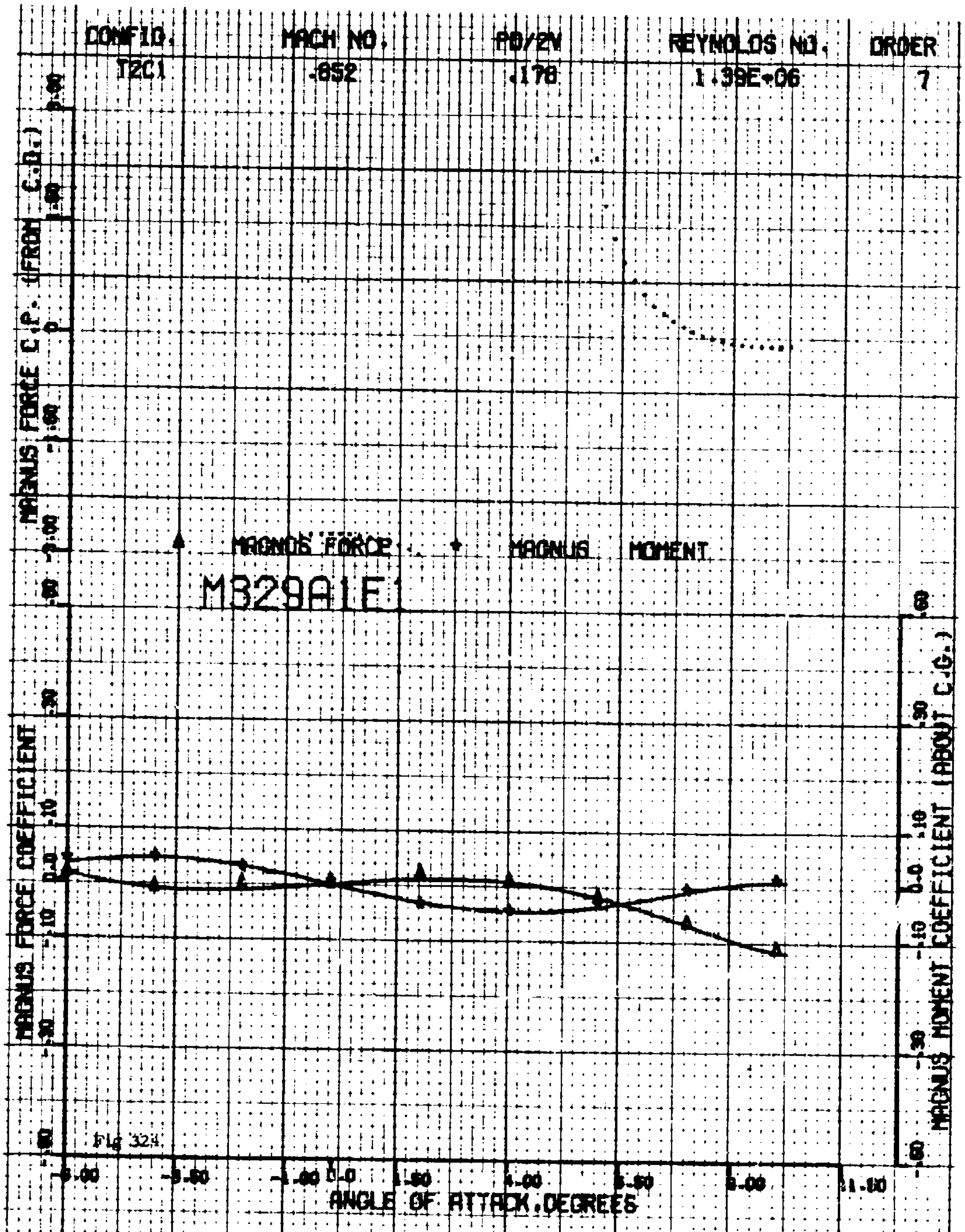

CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.852
.107
1.39E+06
7
MAGNUS FORCE C.P. (FROM C.B.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 322



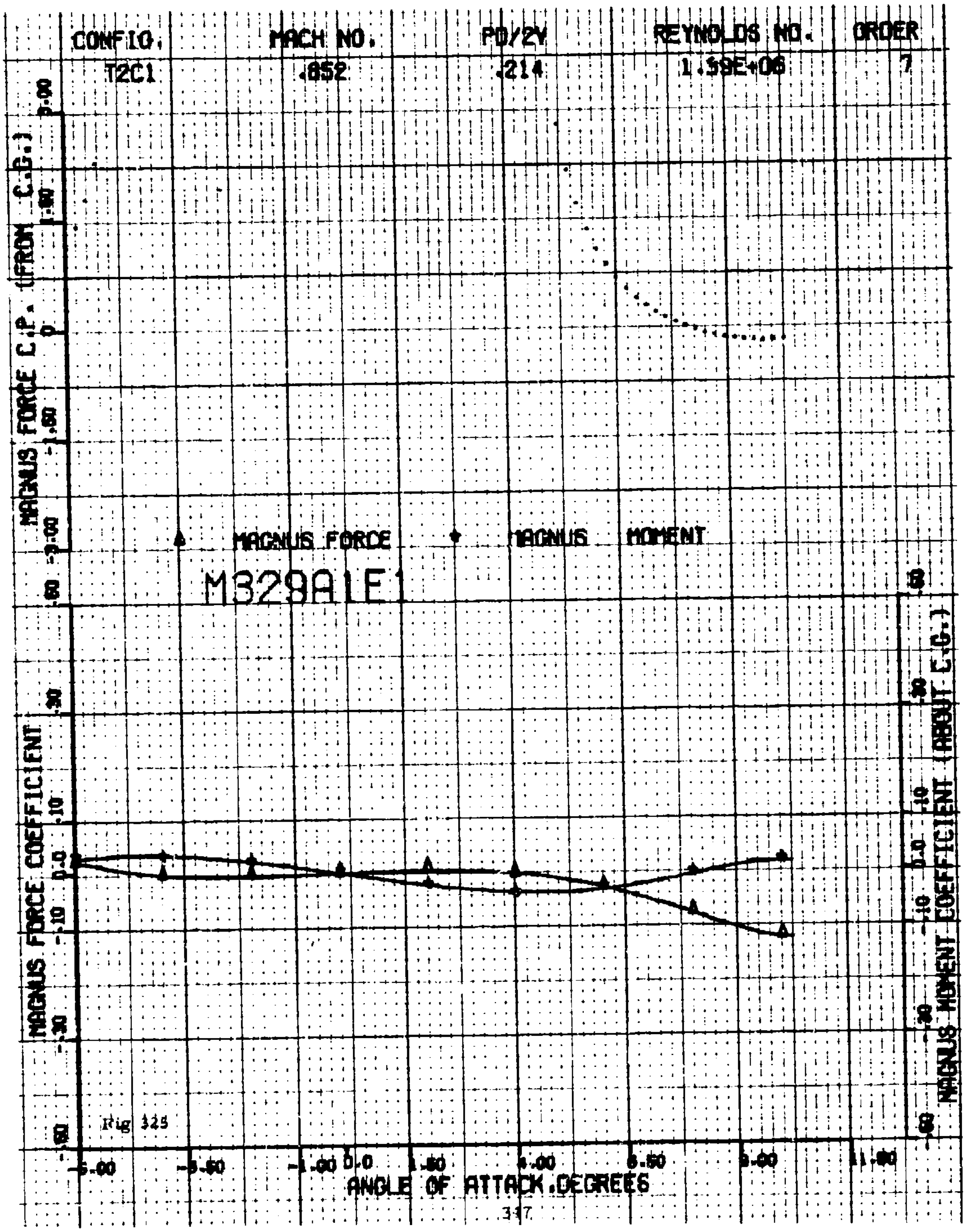
CONFIG.
T2C1
MACH NO.
.852
PD/2V
.149
REYNOLDS NO.
1.39E+06
ORDER
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1F1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig. 323



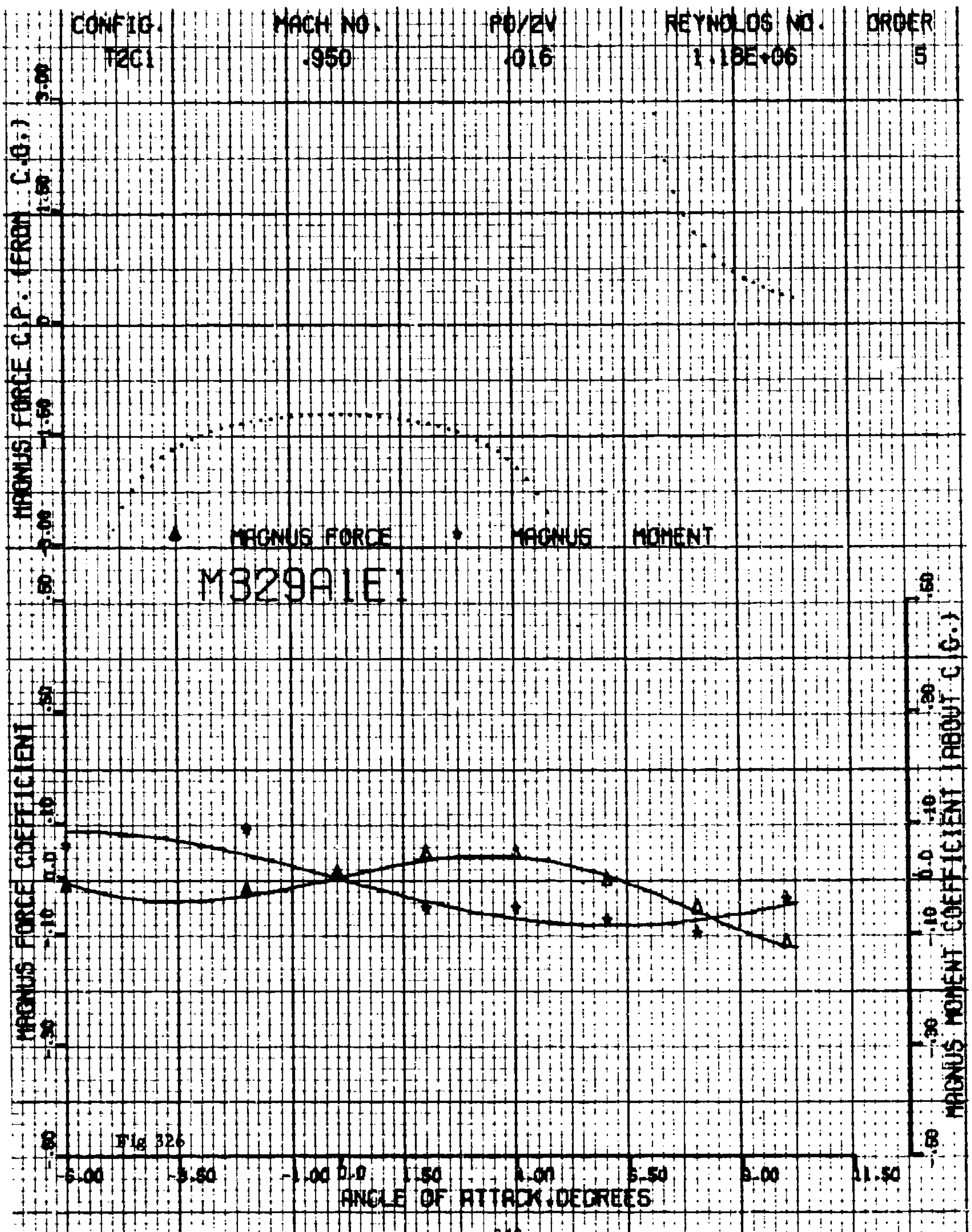
CONFIG. T2C1
MACH NO. .652
PD/2V .178
REYNOLDS NO. 1.39E+06
ORDER 7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
ANGLE OF ATTACK, DEGREES

Fig 324

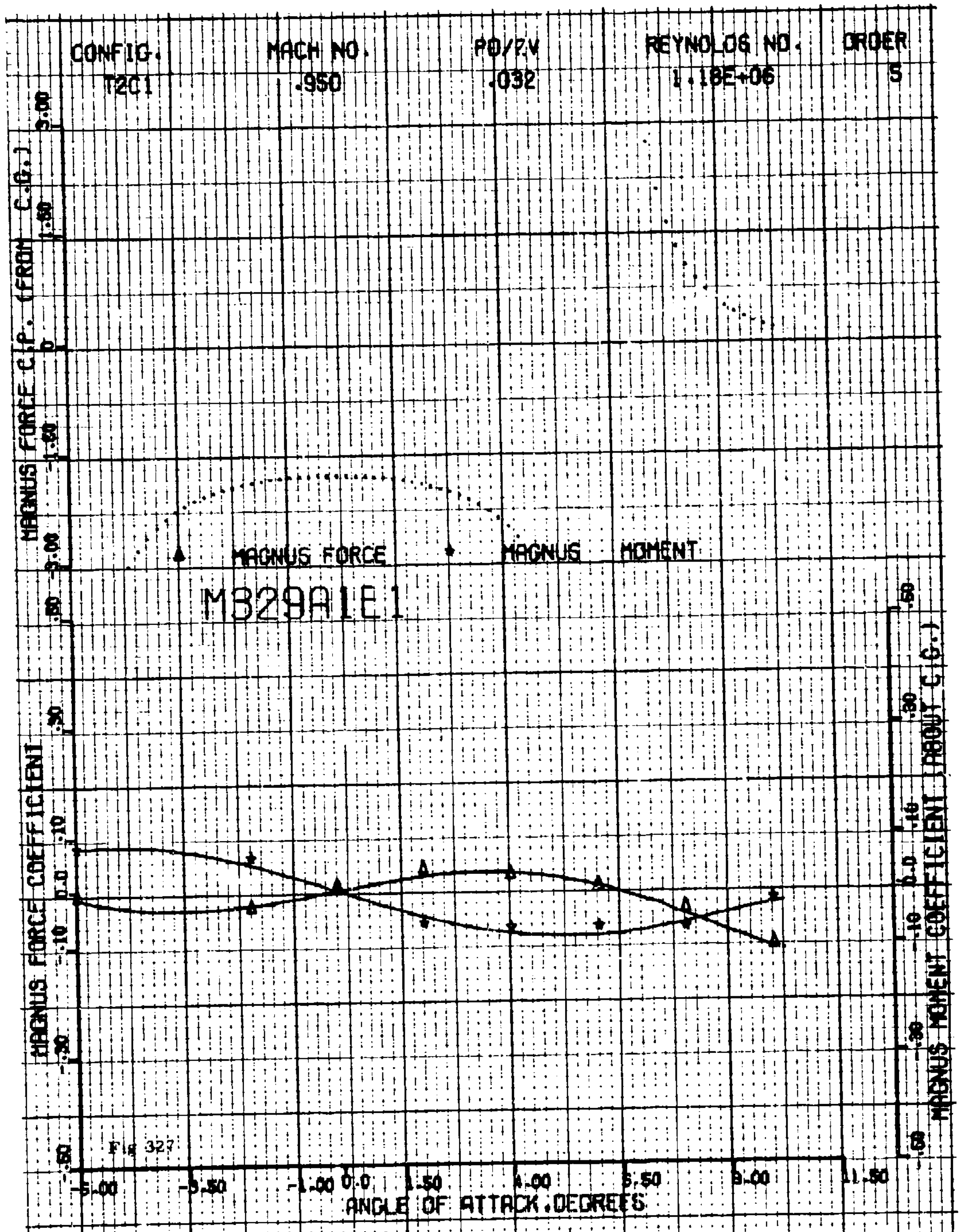


CONFIG.
MACH NO.
PD/2V
REYNOLDS NO.
ORDER
T2C1
.852
.214
1.39E+06
7
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES

Fig 325



CONFIG. T2C1
MACH NO. .950
PD/2V .016
REYNOLDS NO. 1.18E+06
ORDER 5
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
Fig 326



CONFIG. T2C1
MACH NO. .950
PD/2V .032
REYNOLDS NO. 1.18E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 327

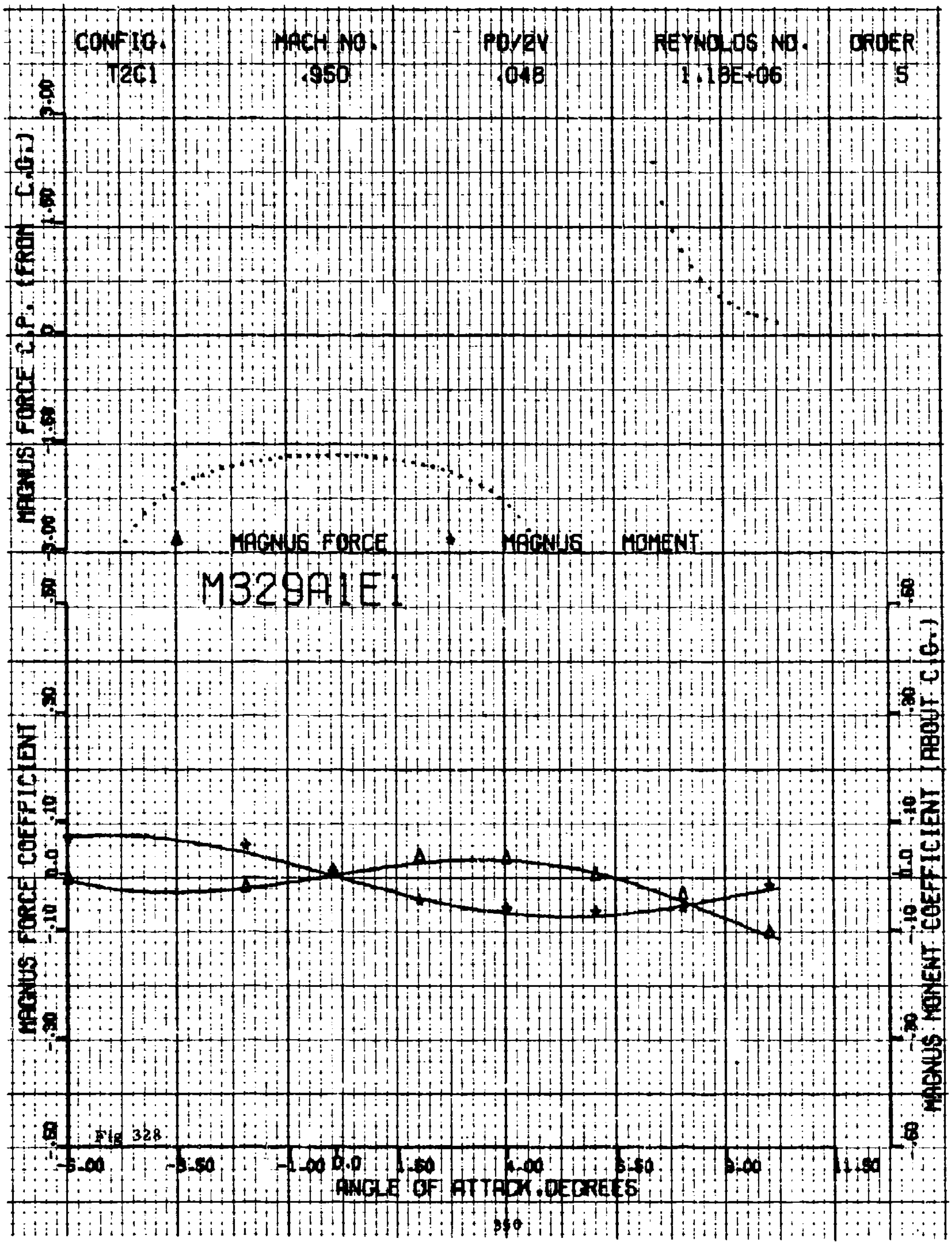
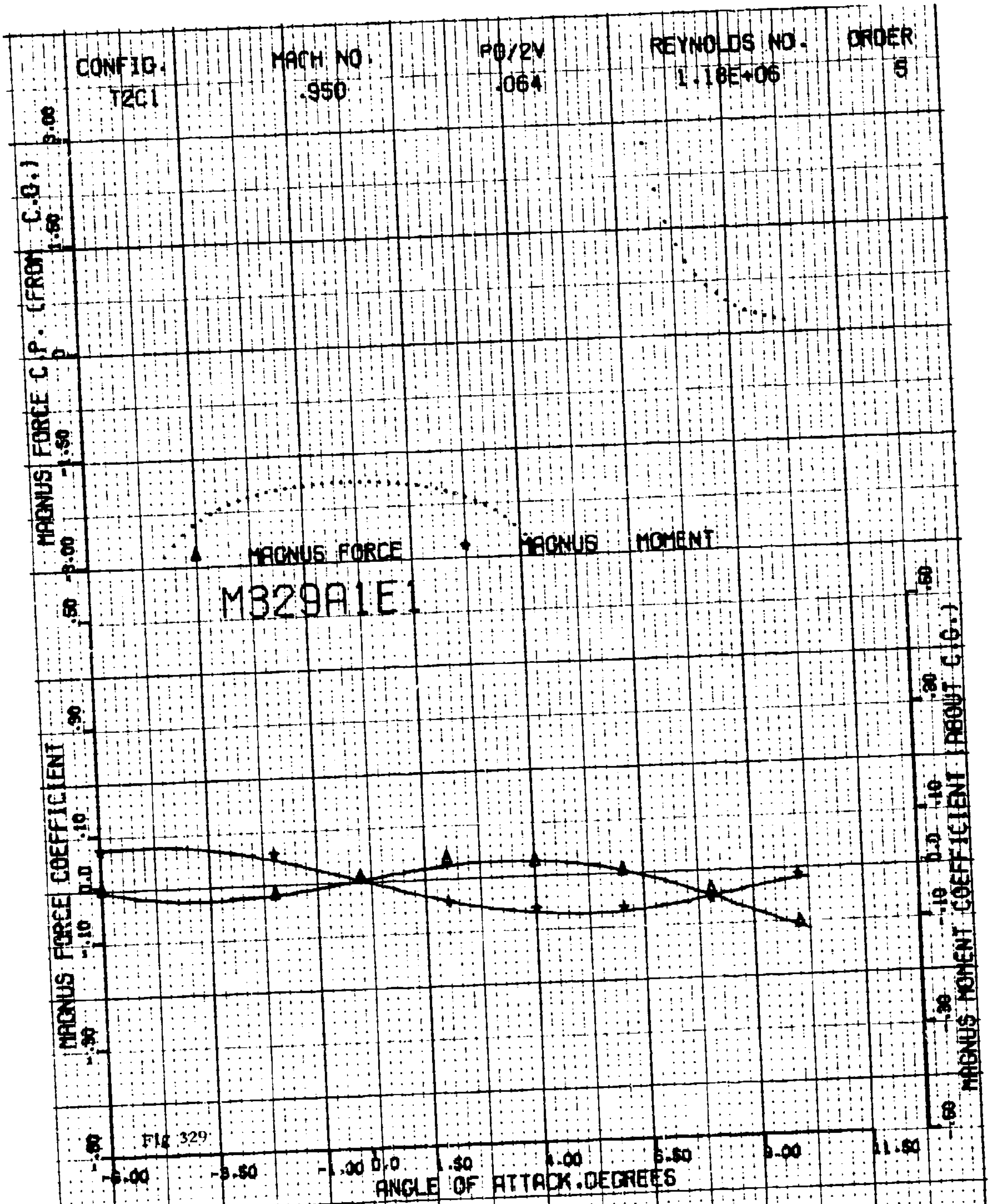
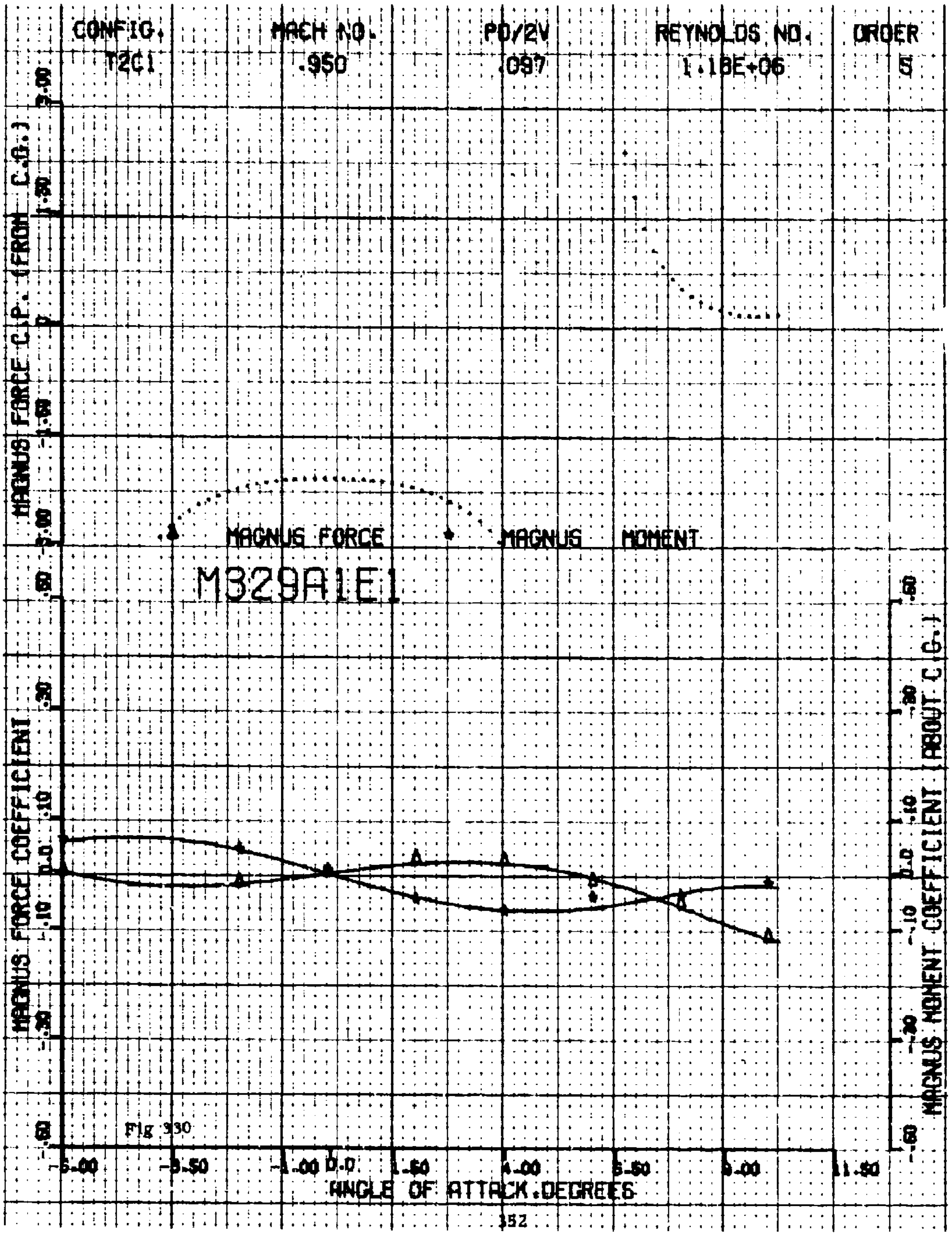

CONFIG. T2C1
MACH NO. .950
PD/2V .048
REYNOLDS NO. 1.18E+06
ORDER 5
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 328



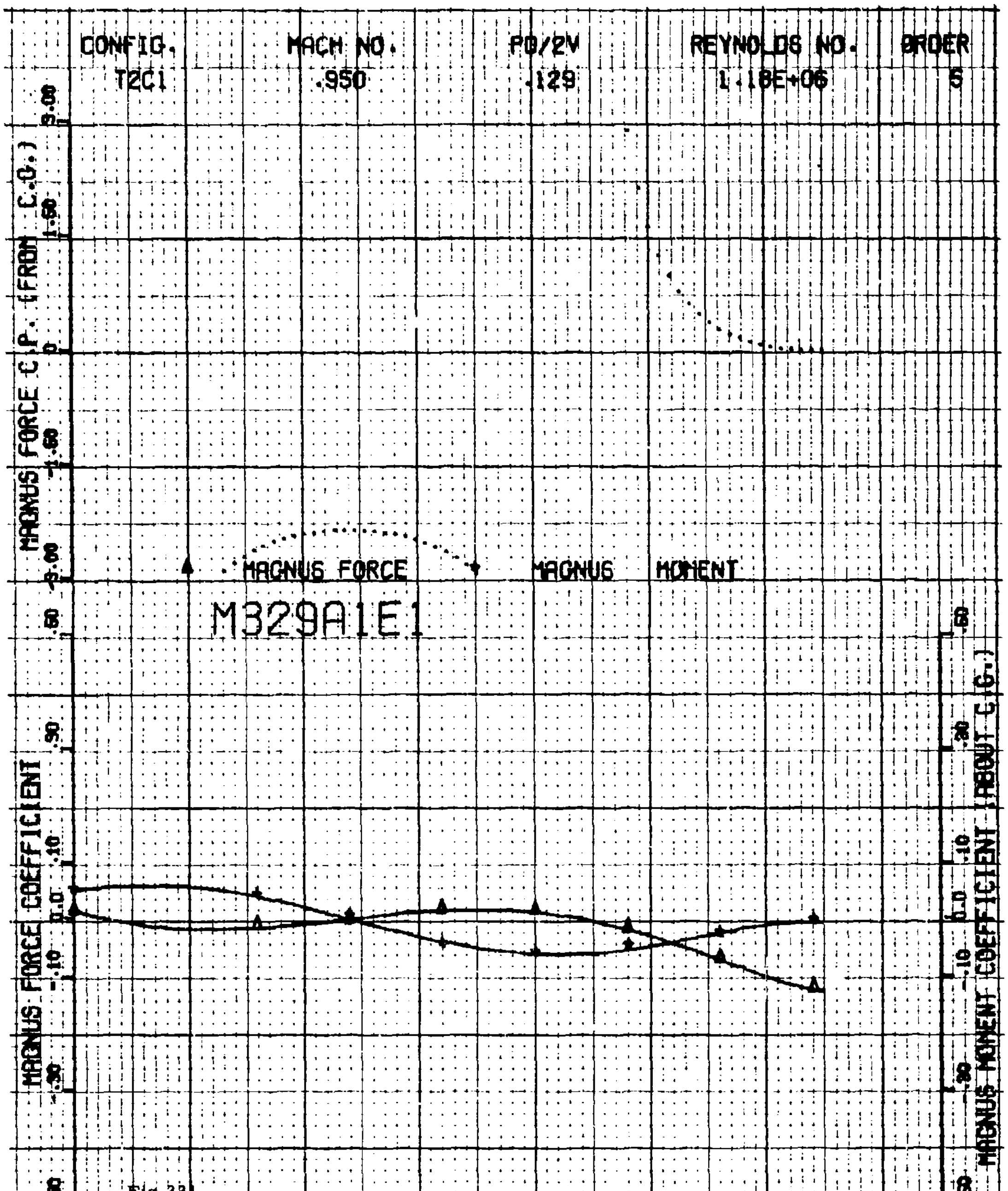
CONFIG.
T2C1
MACH NO.
.950
PD/2V
.064
REYNOLDS NO.
1.18E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
.50
.30
.10
0.0
-.10
-.30
-.50
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK, DEGREES

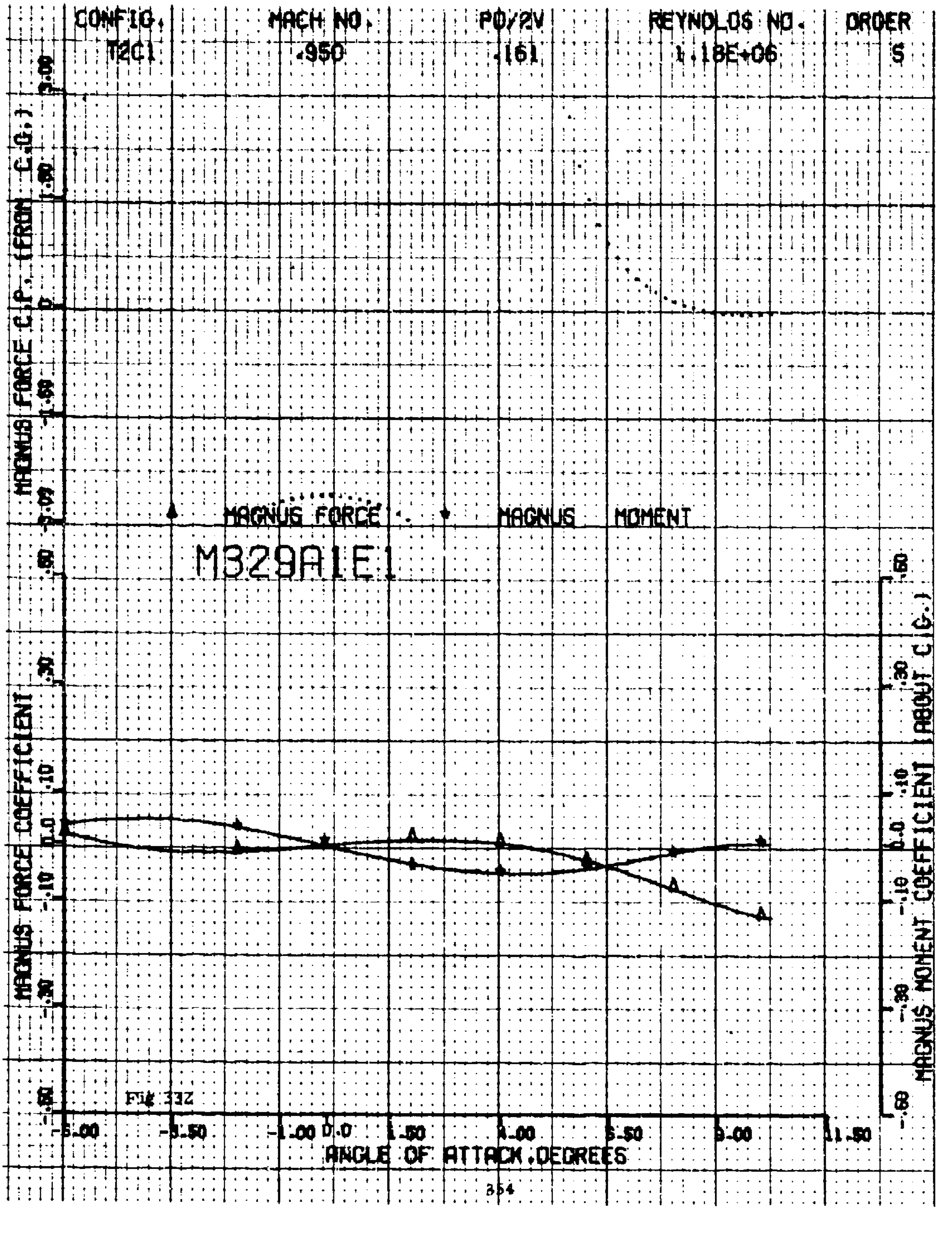
Fig 329



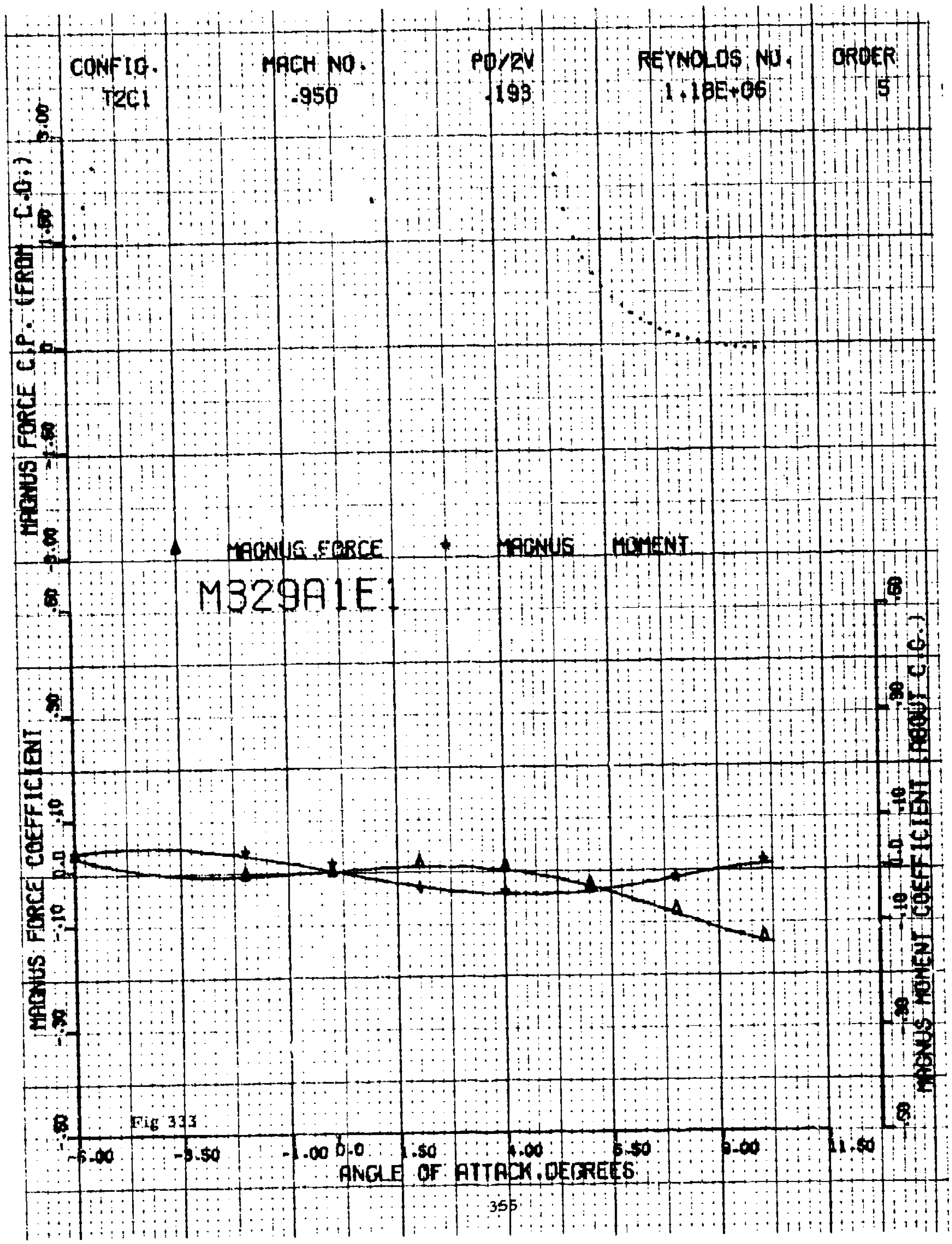
CONFIG.
T2C1
MACH NO.
.950
PD/2V
.097
REYNOLDS NO.
1.18E+06
ORDER
5
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES

Fig 330


CONFIG. T2C1
MACH NO. .950
PD/2V .129
REYNOLDS NO. 1.18E+06
ORDER 5
MAGNUS FORCE C.P. (FROM C.G.)
3.00
1.50
0
-1.50
-3.00
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
.50
.30
.10
0.0
-.10
-.30
-.50
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK,DEGREES
Fig 331



CONFIG.
T2C1
MACH NO.
.950
PD/2V
.161
REYNOLDS NO.
1.18E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
Fig 332
ANGLE OF ATTACK,DEGREES



CONFIG.
T2C1
MACH NO.
.950
PD/2V
.193
REYNOLDS NO.
1.18E+06
ORDER
5
MAGNUS FORCE C.P. (FROM C.G.)
MAGNUS FORCE
MAGNUS MOMENT
M329A1E1
MAGNUS FORCE COEFFICIENT
MAGNUS MOMENT COEFFICIENT (ABOUT C.G.)
-6.00
-3.50
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
ANGLE OF ATTACK,DEGREES

Fig 333

Figures 334 through 357

Pitching moment secant slope, Magnus moment secant slope
vs angle of attack

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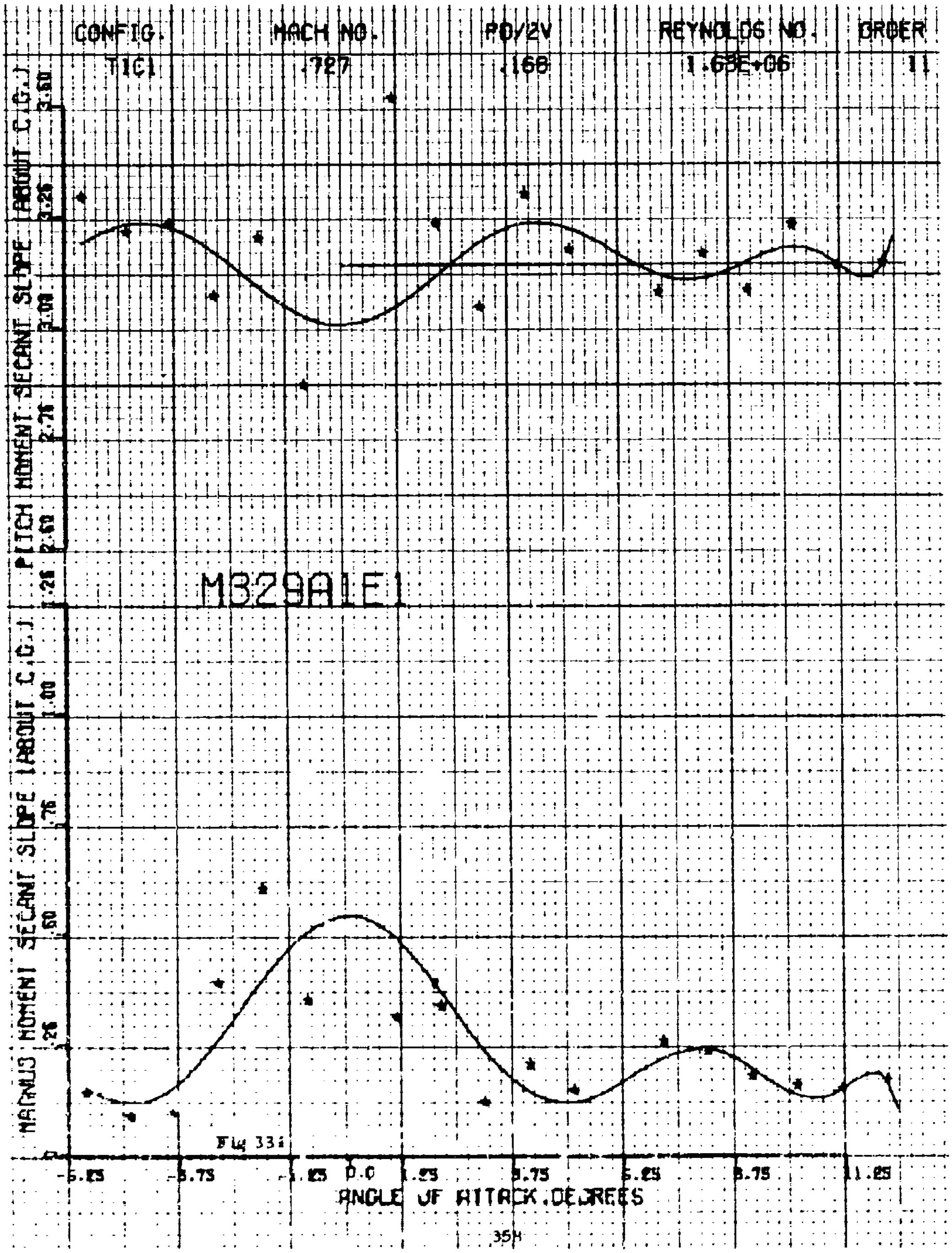
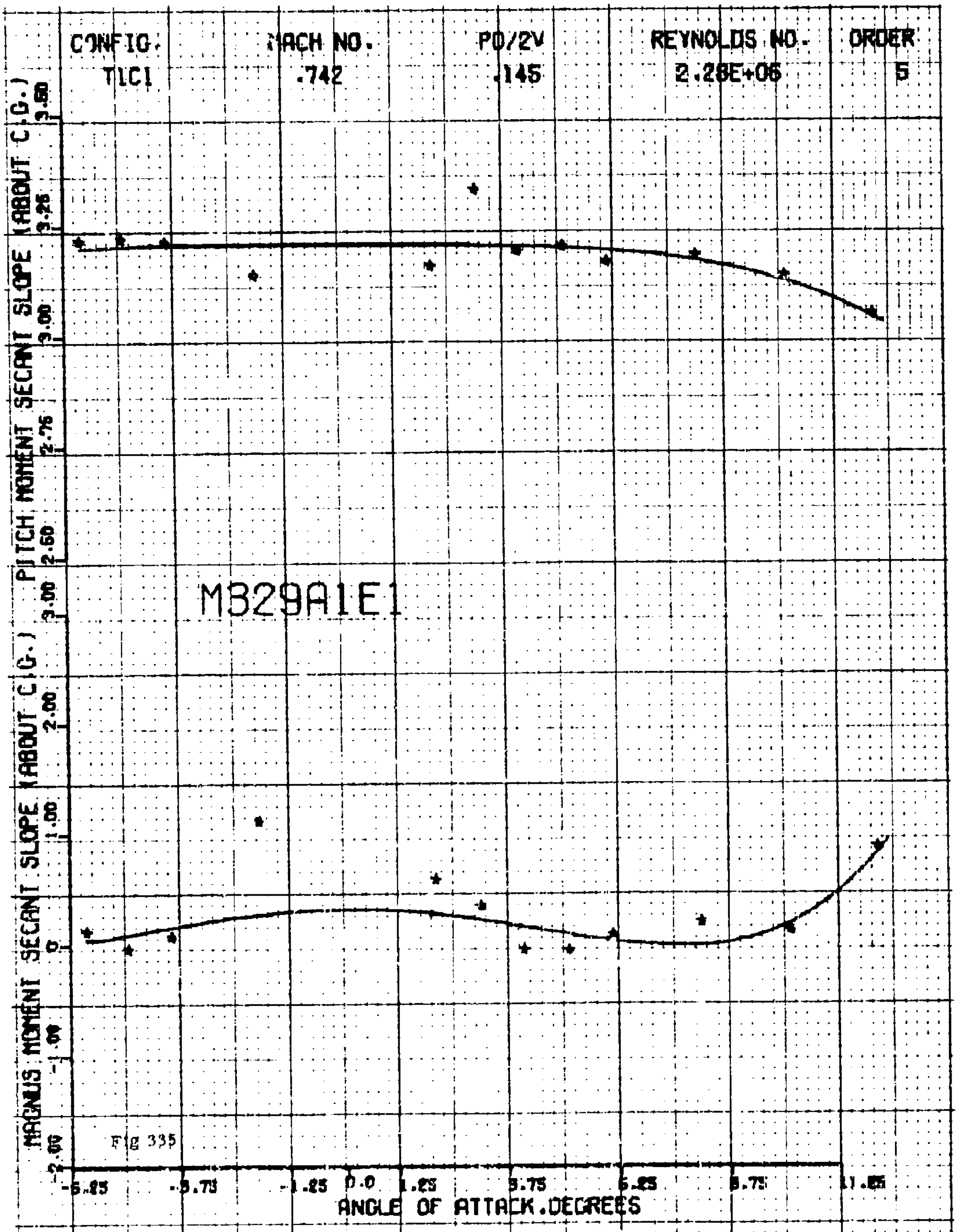


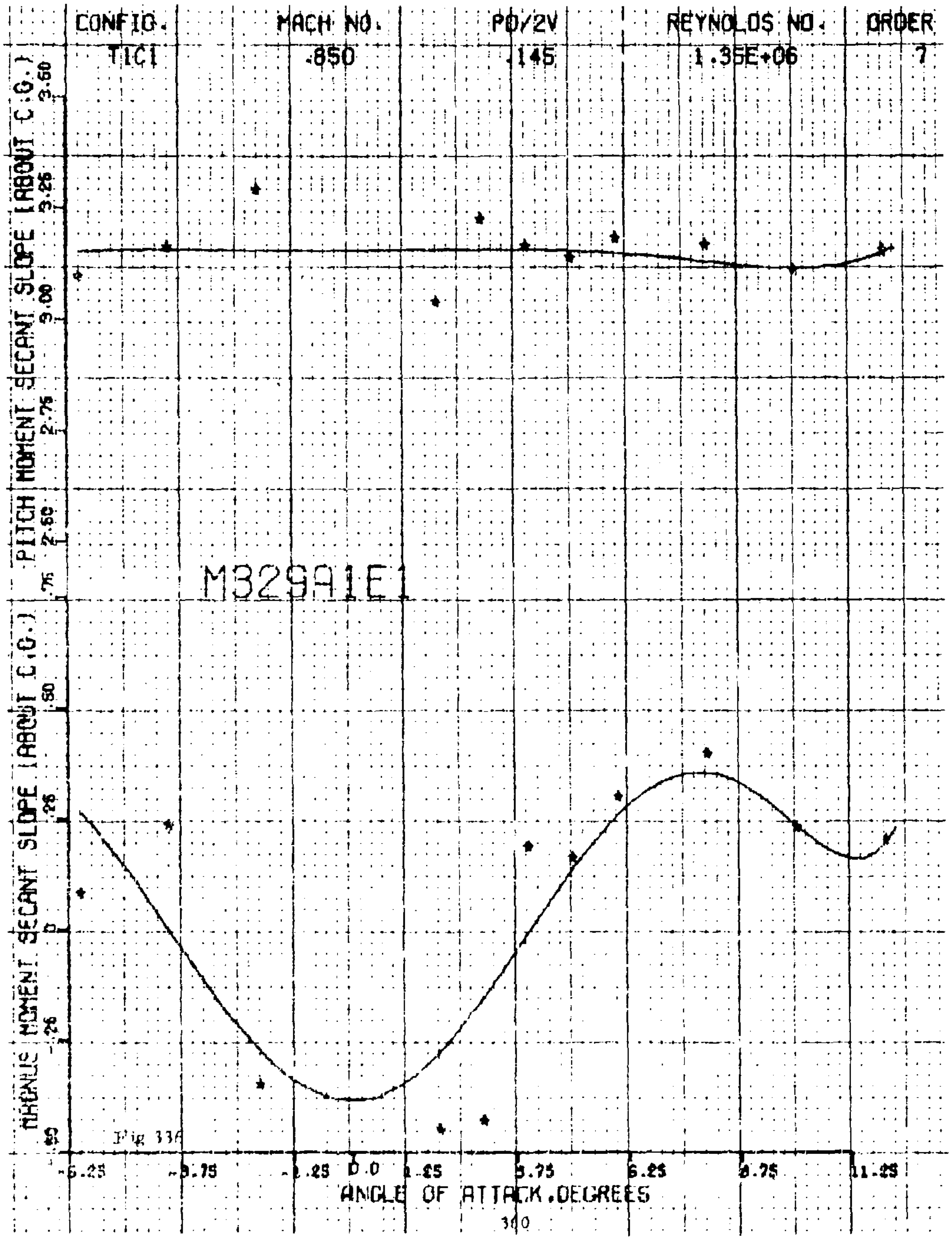
CONFIG.
T1C1
MACH NO.
.727
PD/2V
.168
REYNOLDS NO.
1.63E+06
ORDER
11
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
3.50
3.25
3.00
2.75
2.50
M329A1E1
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
1.25
1.00
.75
.50
.25
-5.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK,DEGREES

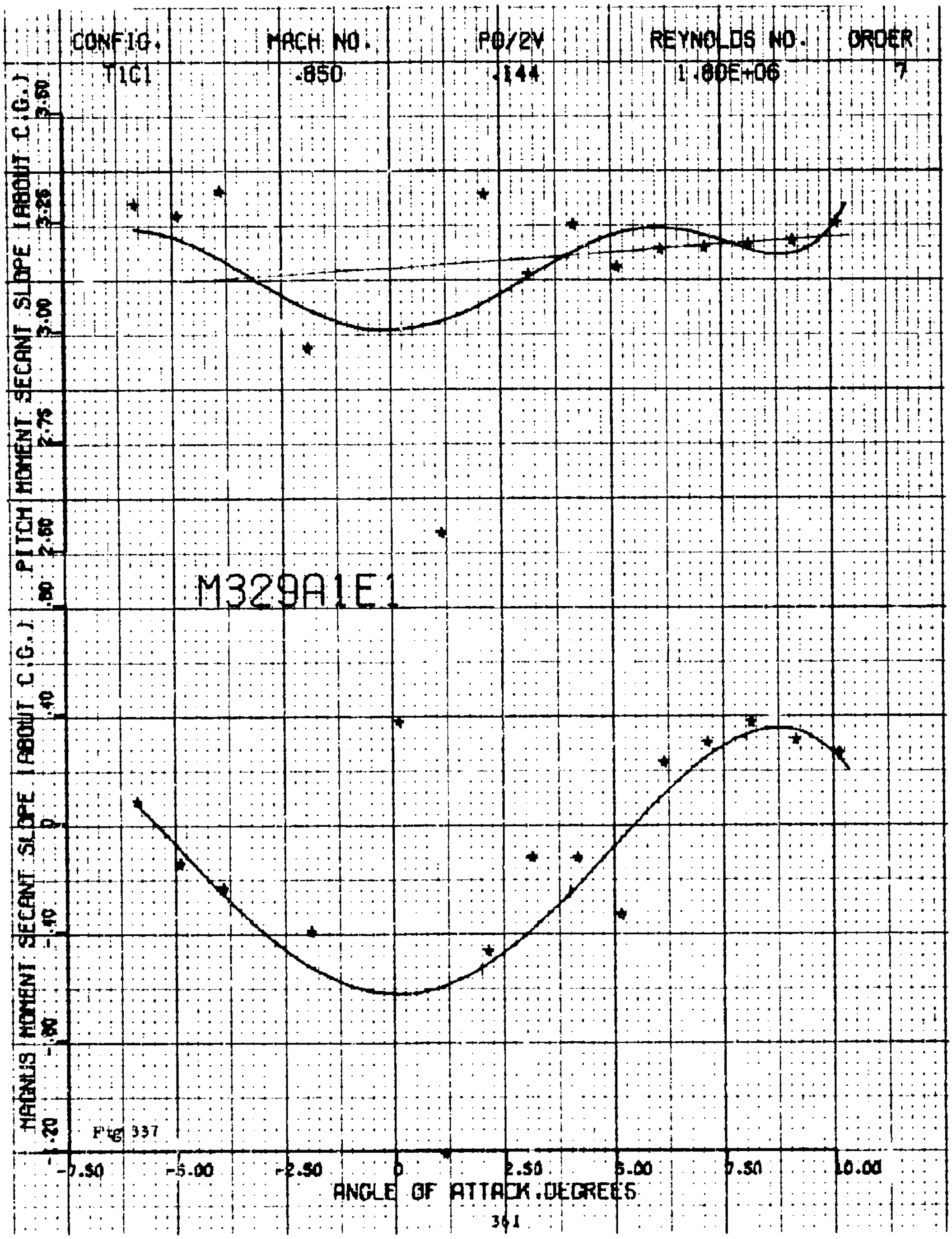
Fig 33i



CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T1C1 .742 .145 2.28E+06 5
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK, DEGREES

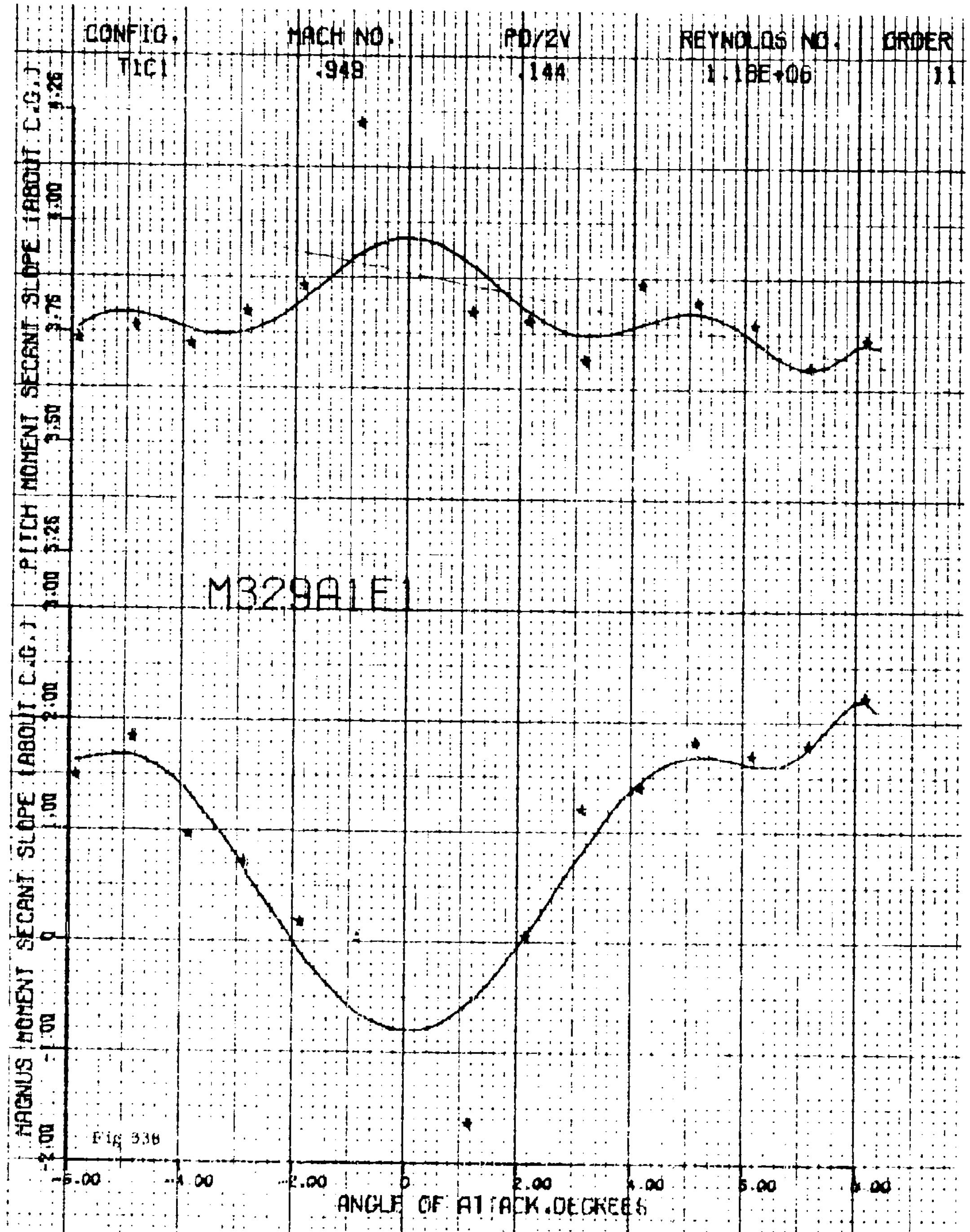
Fig 335

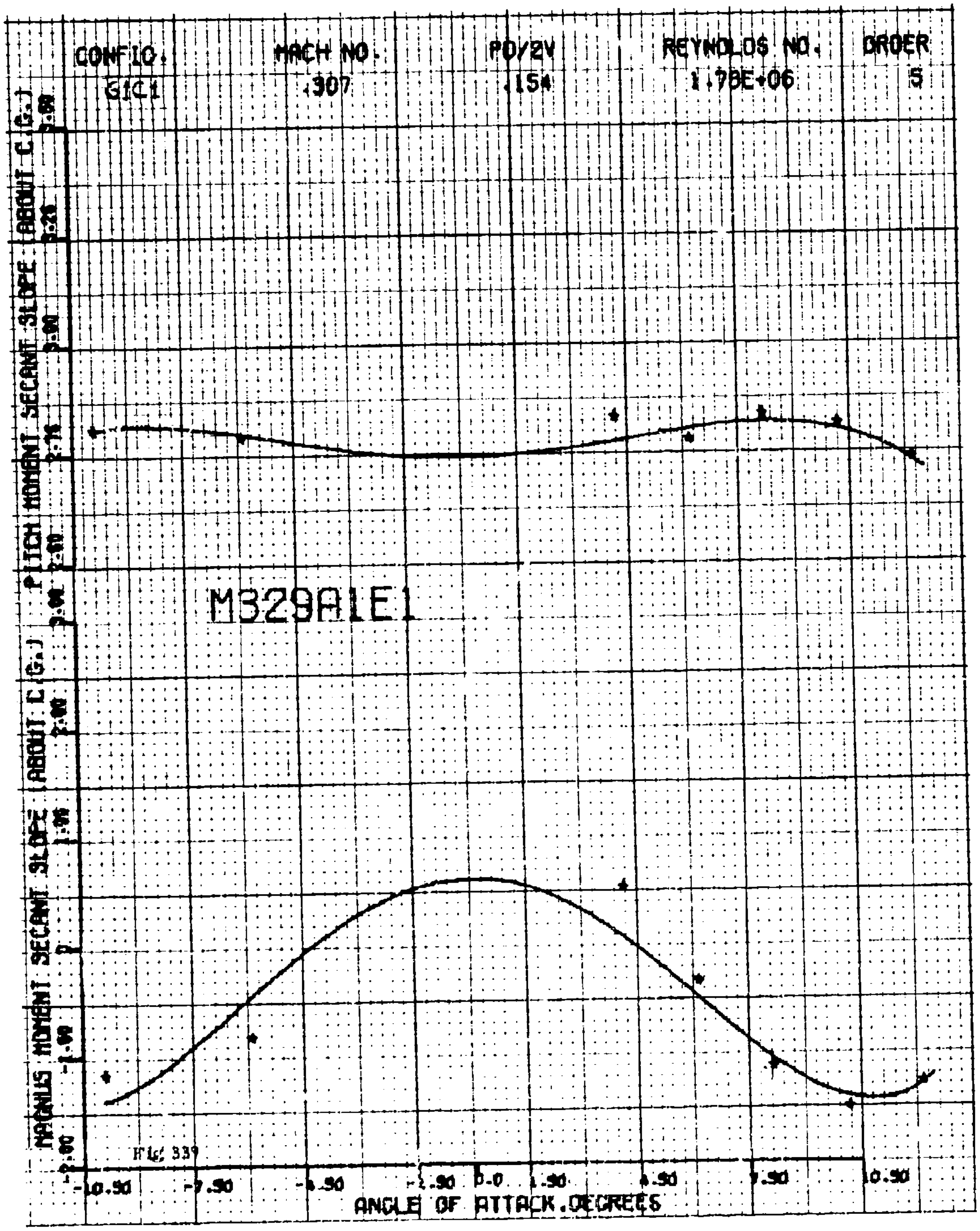

CONFIG. TICI
MACH NO. .850
PD/2V .145
REYNOLDS NO. 1.35E+06
ORDER 7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK, DEGREES
Fig 33A

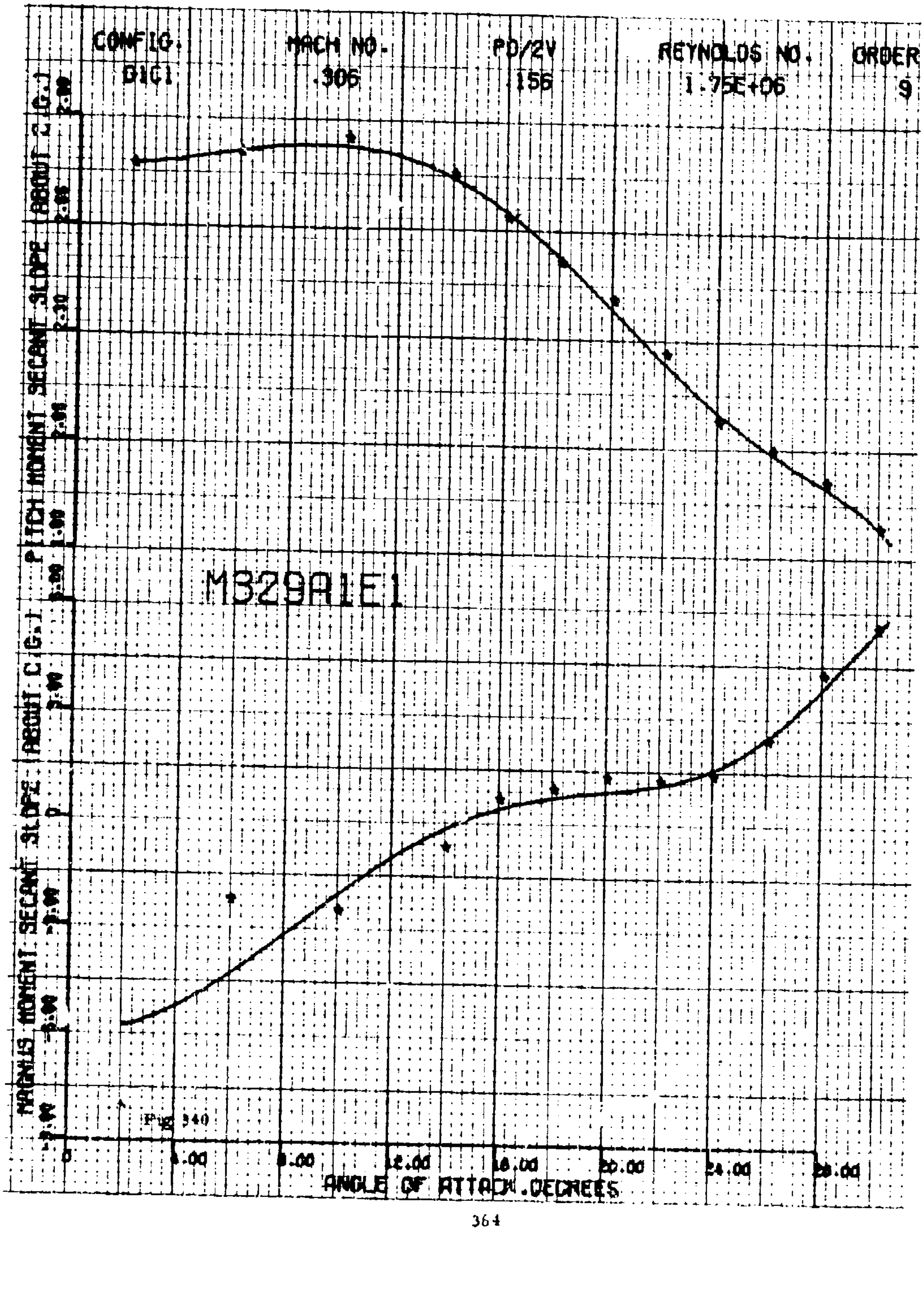


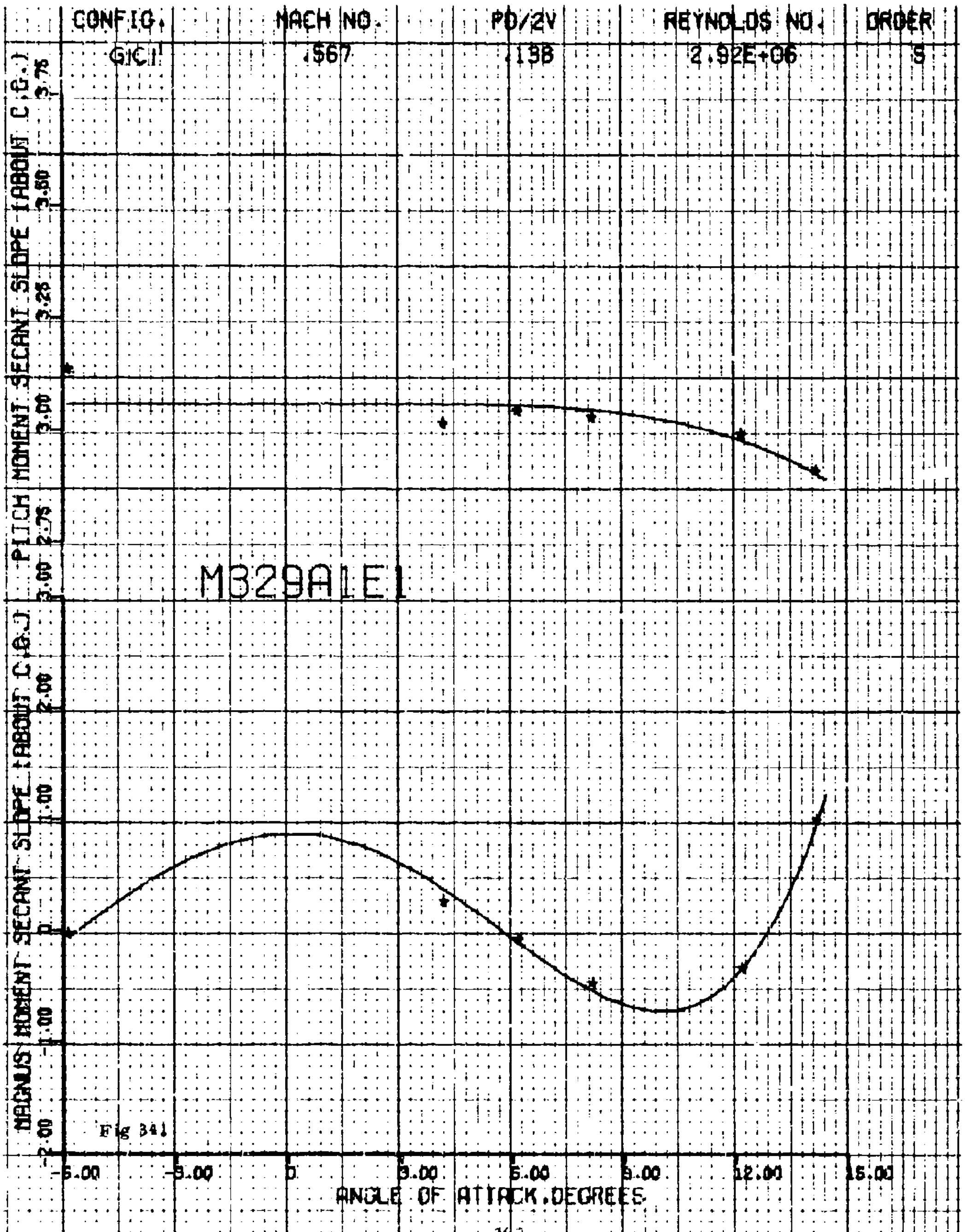
CONFIG. T1C1
MACH NO. .850
PD/2V .144
REYNOLDS NO. 1.80E+06
ORDER 7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
3.50
3.25
3.00
2.75
2.50
M329A1E1
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
.80
.40
0
-.40
-.80
-1.20
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 337


CONFIG.
T1C1
MACH NO.
.949
PD/2V
.144
REYNOLDS NO.
1.18E+06
ORDER
11
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1F1
ANGLE OF ATTACK,DEGREES
Fig 33B

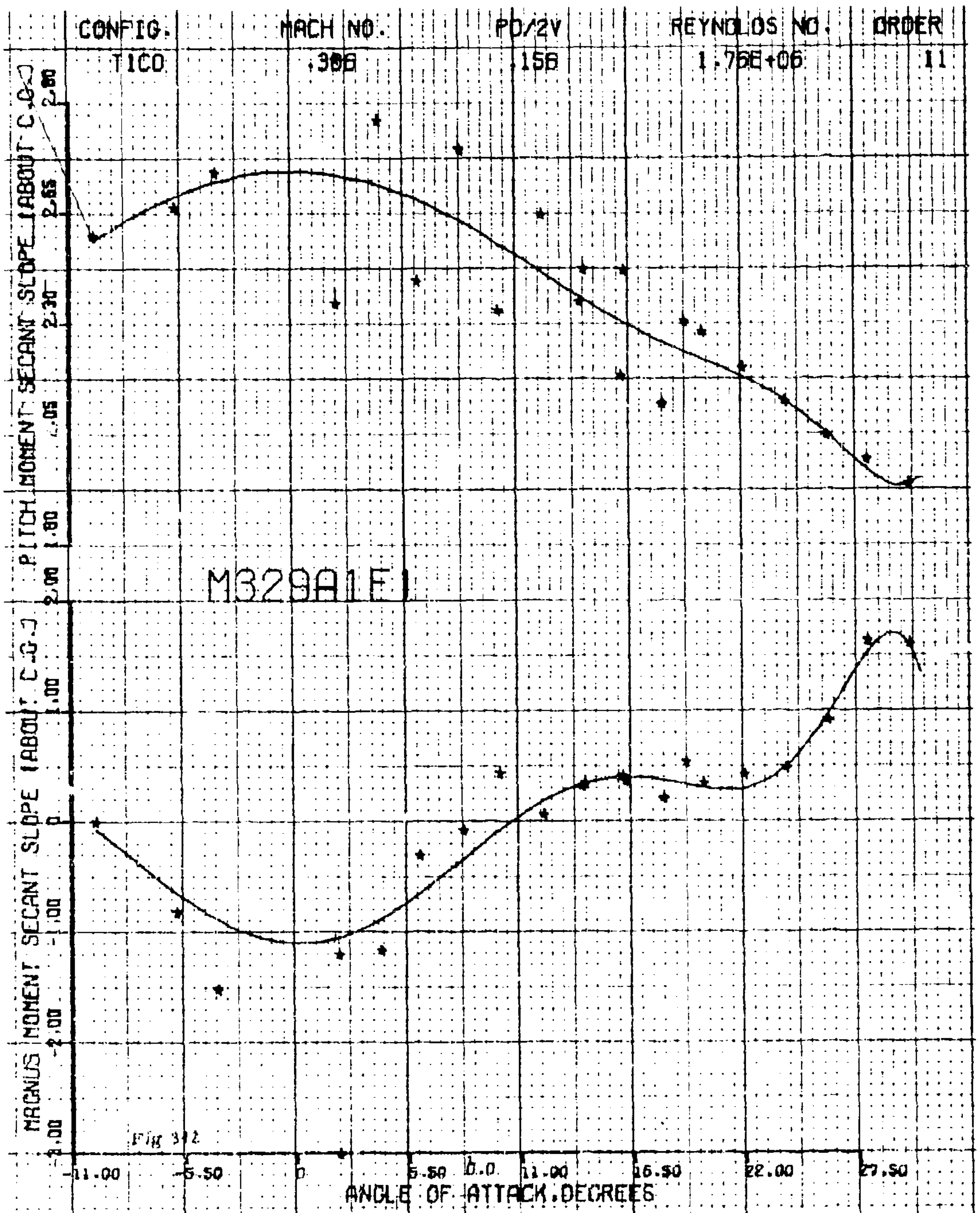

CONFIG. G1C1
MACH NO. .307
PD/2V .154
REYNOLDS NO. 1.78E+06
ORDER 5
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-10.50
-7.50
-4.50
-1.50
0.0
1.50
4.50
7.50
10.50
Fig. 339

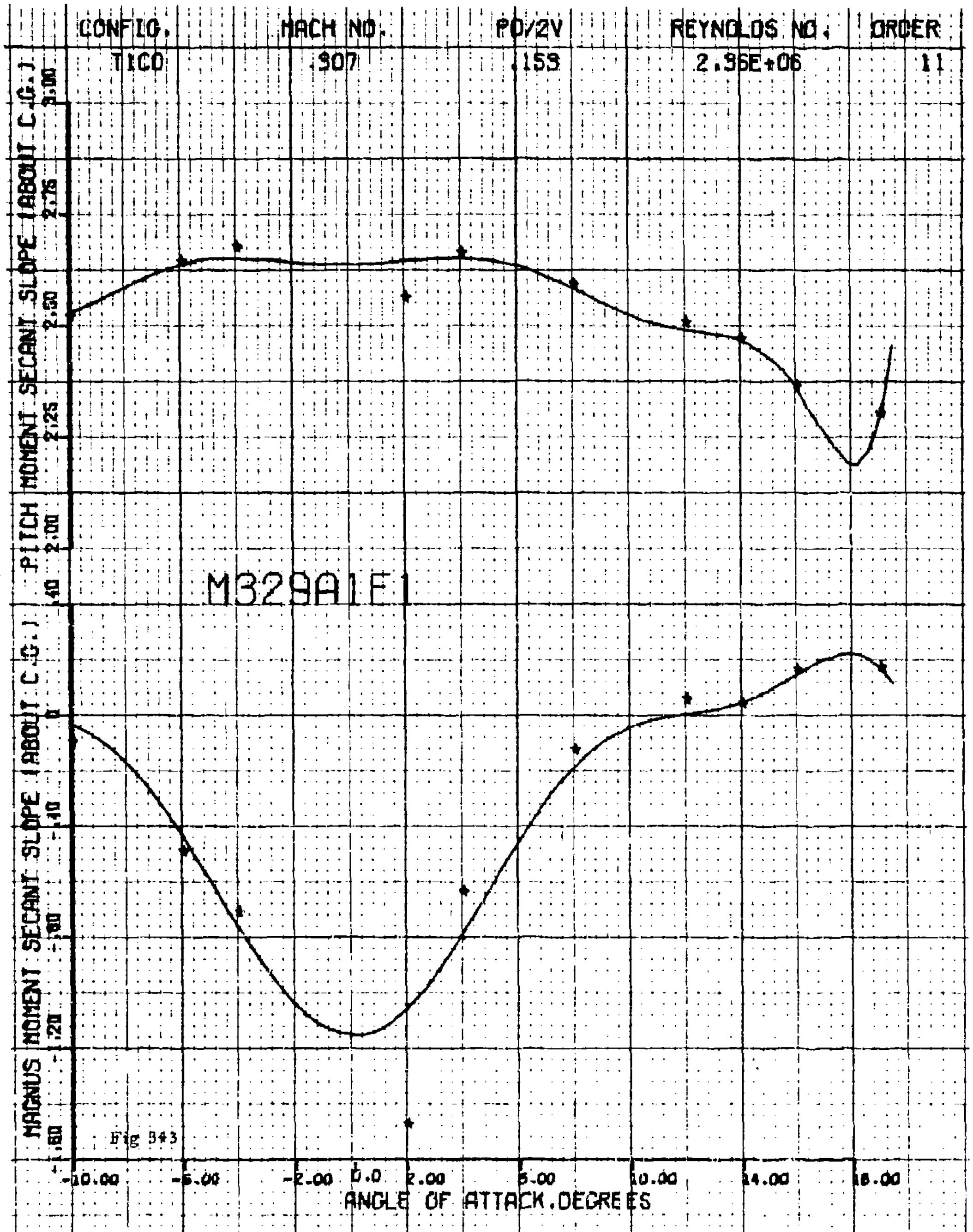

CONFIG.
D1C1
MACH NO.
.306
PD/2V
.156
REYNOLDS NO.
1.75E+06
ORDER
9
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK,DEGREES

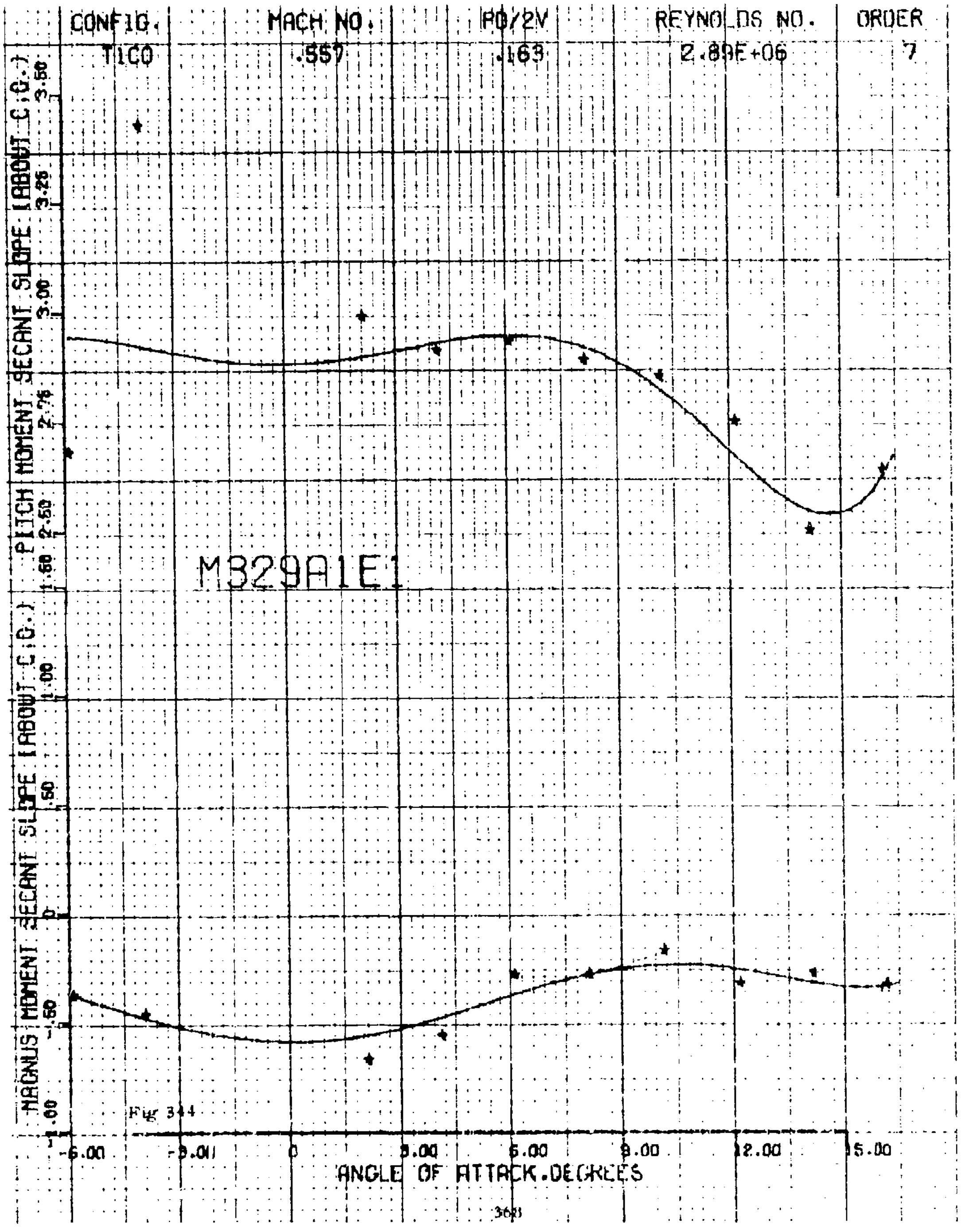


CONFIG.
G1C1
MACH NO.
.567
PD/2V
.138
REYNOLDS NO.
2.92E+06
ORDER
5
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
3.75
3.50
3.25
3.00
2.75
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
3.00
2.00
1.00
0
-1.00
-2.00
M329A1E1
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

Fig 341


CONFIG.
TICO
MACH NO.
.306
PD/2V
.156
REYNOLDS NO.
1.76E+06
ORDER
11
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK, DEGREES
-11.00
-5.50
0
5.50
11.00
16.50
22.00
27.50


CONFIG.
TICO
MACH NO.
.907
PD/2V
.153
REYNOLDS NO.
2.36E+06
ORDER
11
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1F1
Fig 343
-10.00
-6.00
-2.00
0.0
2.00
6.00
10.00
14.00
18.00
ANGLE OF ATTACK,DEGREES



CONFIG.
T1CO
MACH NO.
.557
PD/2V
.163
REYNOLDS NO.
2.89E+06
ORDER
7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
Fig 344
ANGLE OF ATTACK,DEGREES

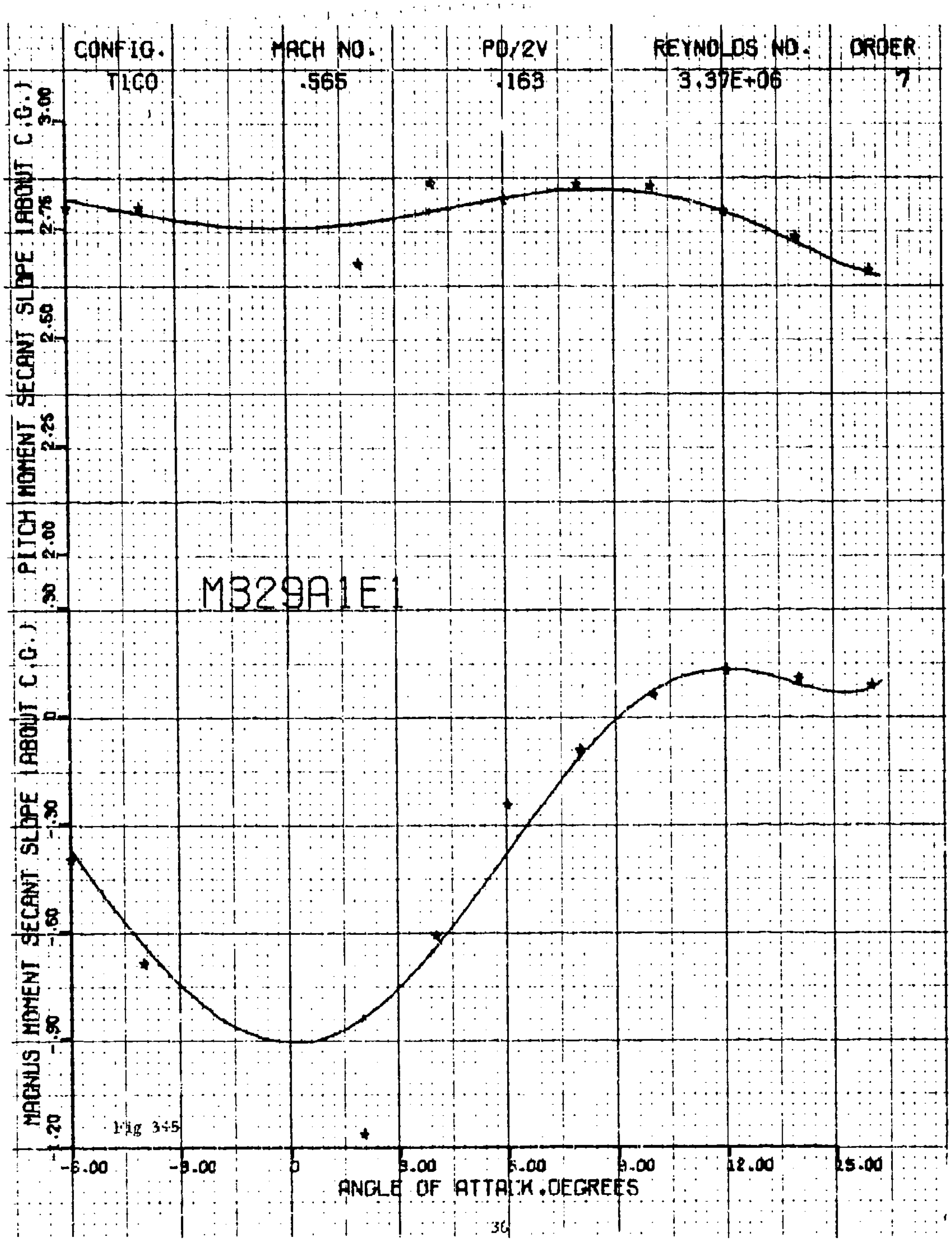
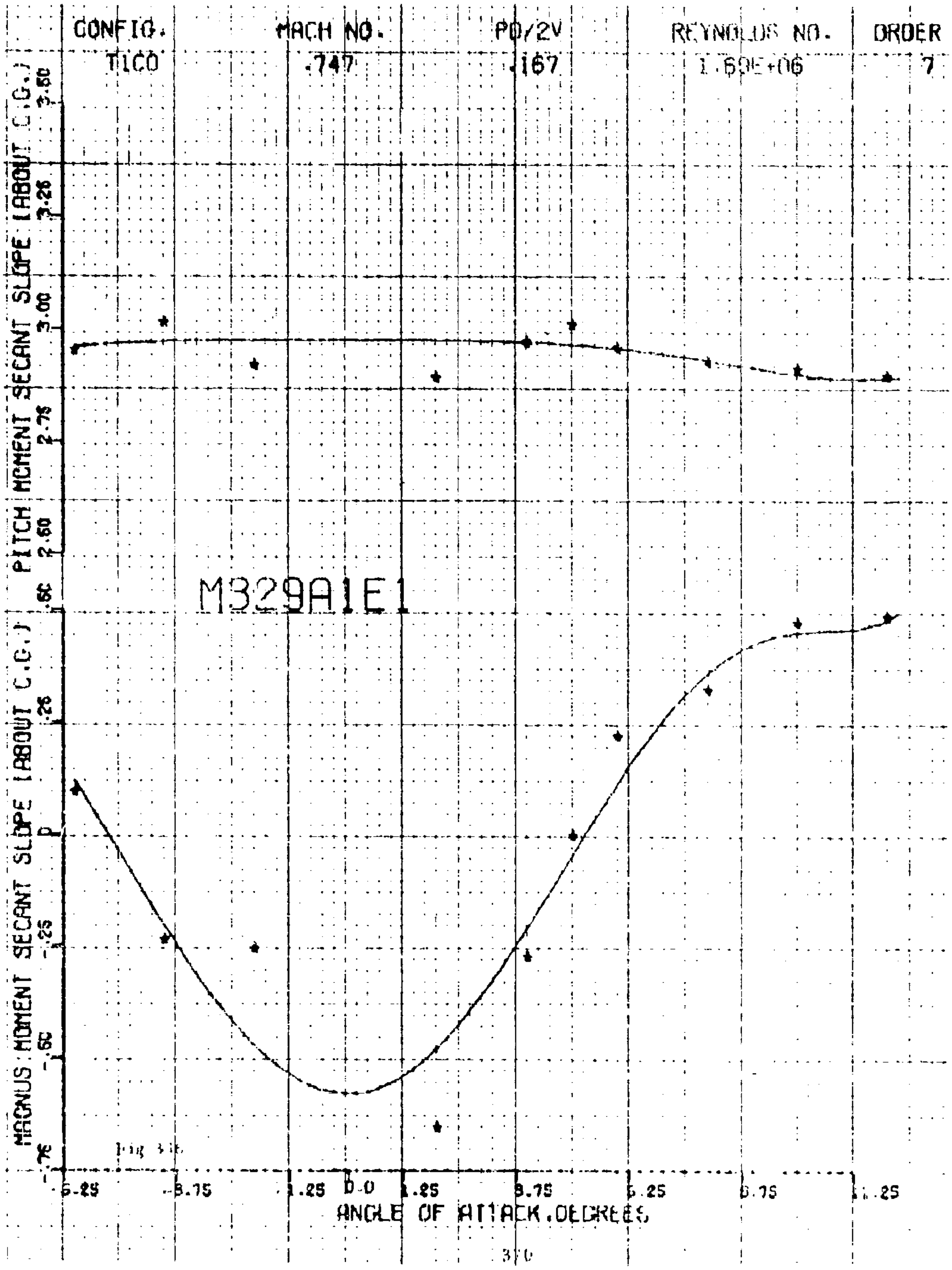
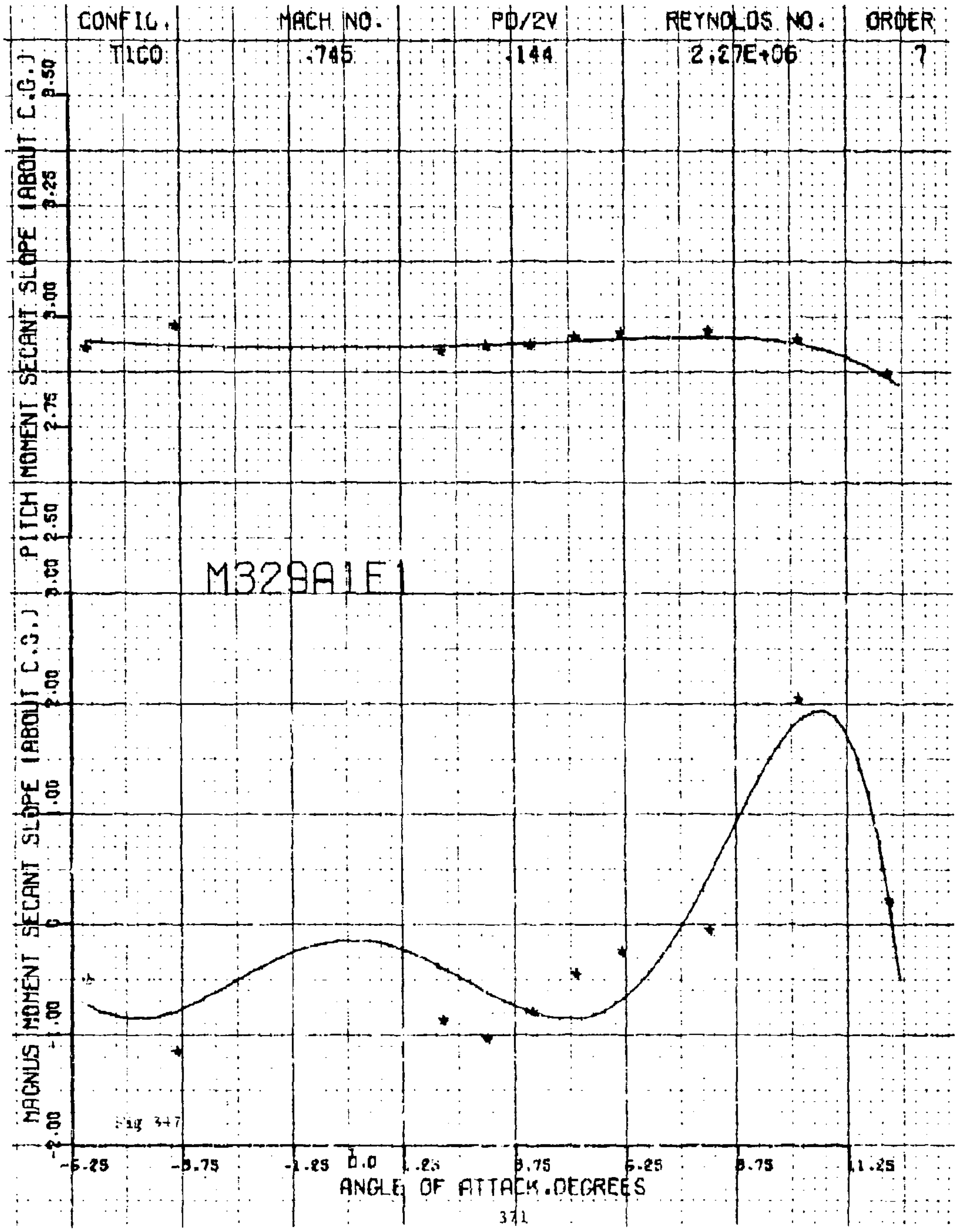

CONFIG.
TLCO
MACH NO.
.565
PD/2V
.163
REYNOLDS NO.
3.37E+06
ORDER
7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK,DEGREES
-6.00
-3.00
0
3.00
6.00
9.00
12.00
15.00

Fig 3-5



CONFIG.
TICO
MACH NO.
.747
PD/2V
.167
REYNOLDS NO.
1.60E+06
ORDER
7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
3.50
3.25
3.00
2.75
2.50
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
.50
.25
0
-.25
-.50
-.75
M329A1E1
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK,DEGREES


CONFIG. TICO
MACH NO. .745
PD/2V .144
REYNOLDS NO. 2.27E+06
ORDER 7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
3.50
3.25
3.00
2.75
2.50
3.00
2.00
1.00
0
-1.00
-2.00
M329A1E1
Fig 347
-6.25
-3.75
-1.25
0.0
1.25
3.75
6.25
8.75
11.25
ANGLE OF ATTACK, DEGREES

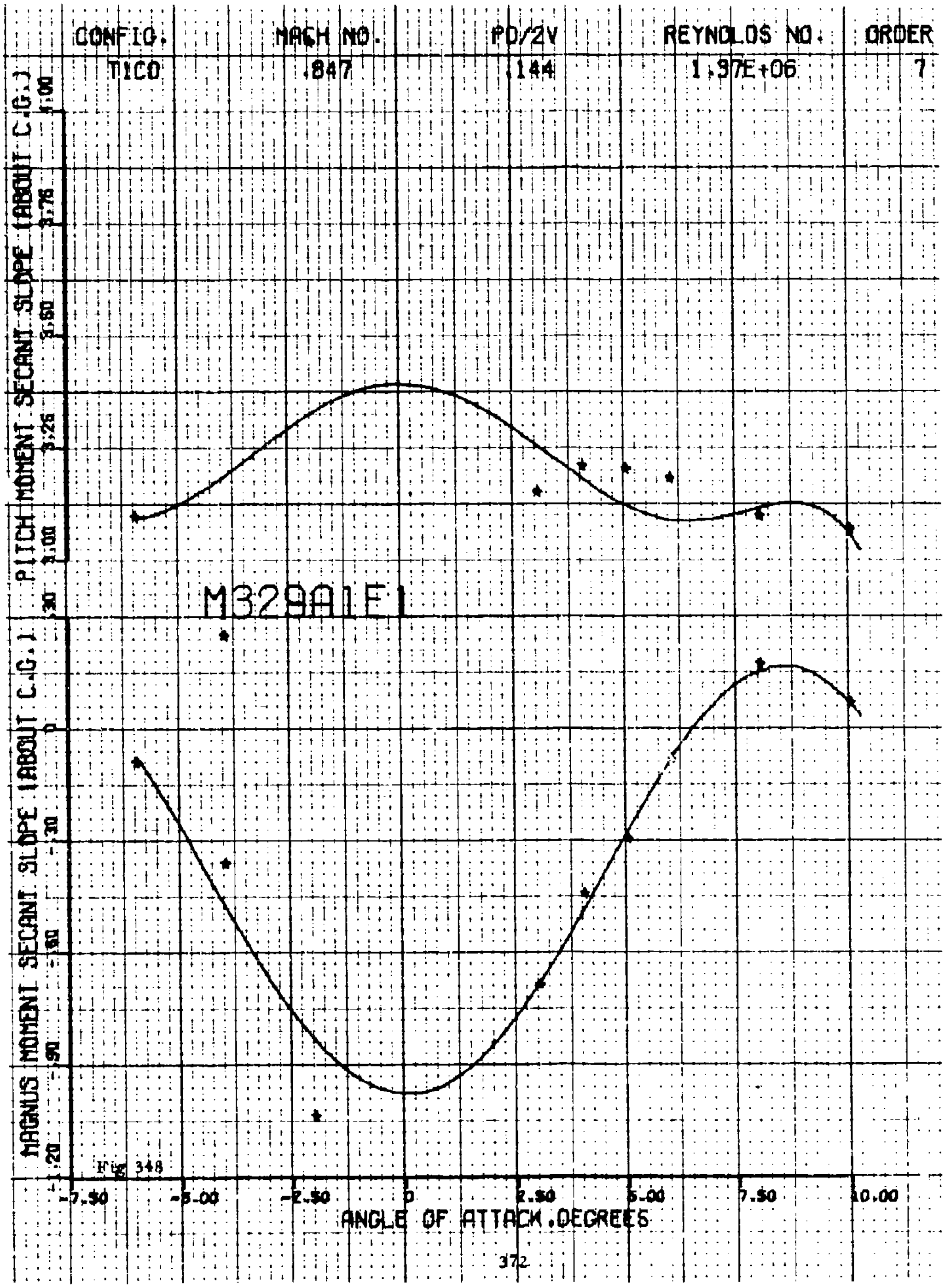
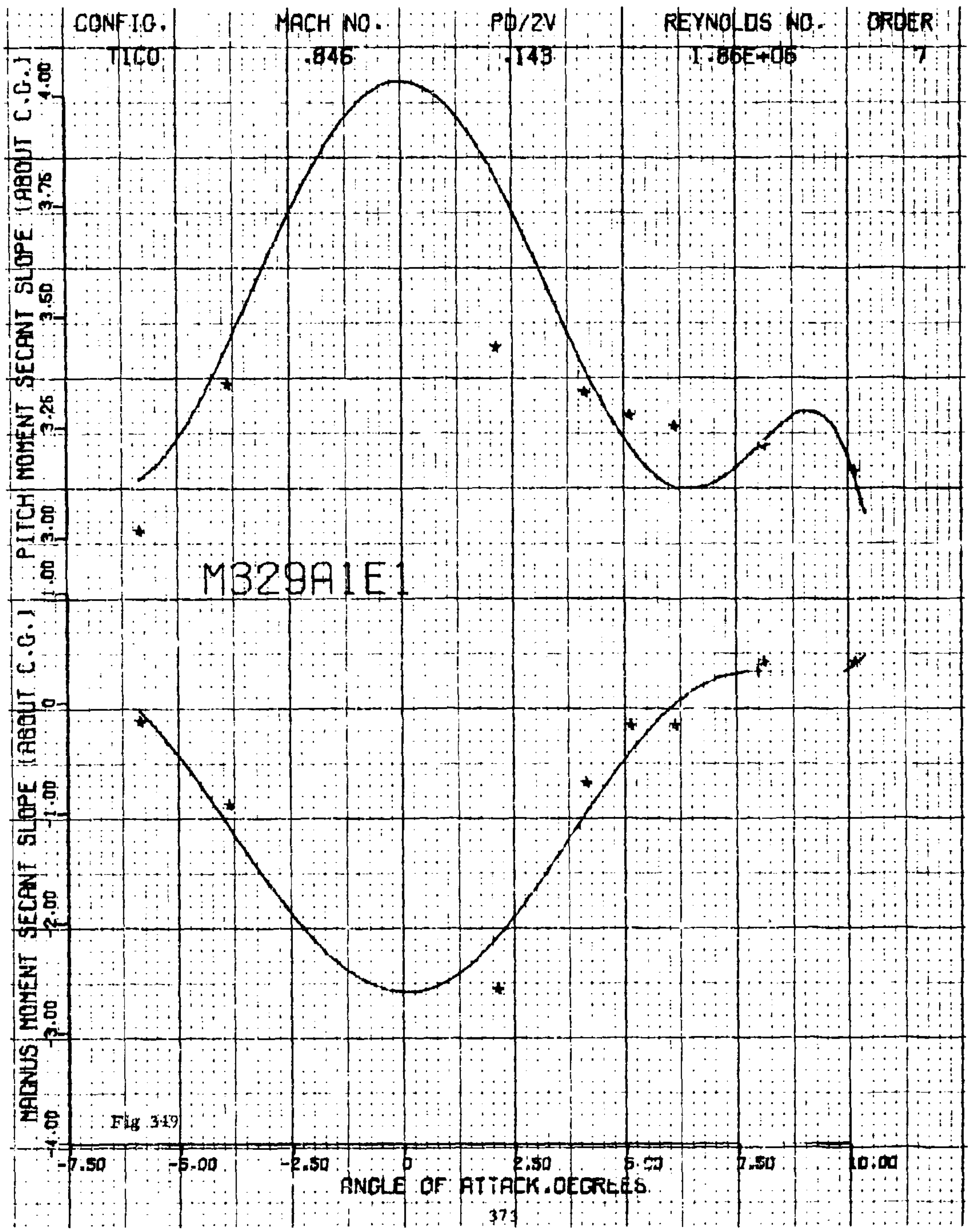

CONFIG. TICO
MACH NO. .847
PD/2V .144
REYNOLDS NO. 1.37E+06
ORDER 7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1F1
ANGLE OF ATTACK,DEGREES

Fig 348



CONFIG.
TICO
MACH NO.
.846
PD/2V
.143
REYNOLDS NO.
1.86E+06
ORDER
7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
4.00
3.75
3.50
3.25
3.00
M329A1E1
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
1.00
0
-1.00
-2.00
-3.00
-4.00
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK, DEGREES

Fig. 349

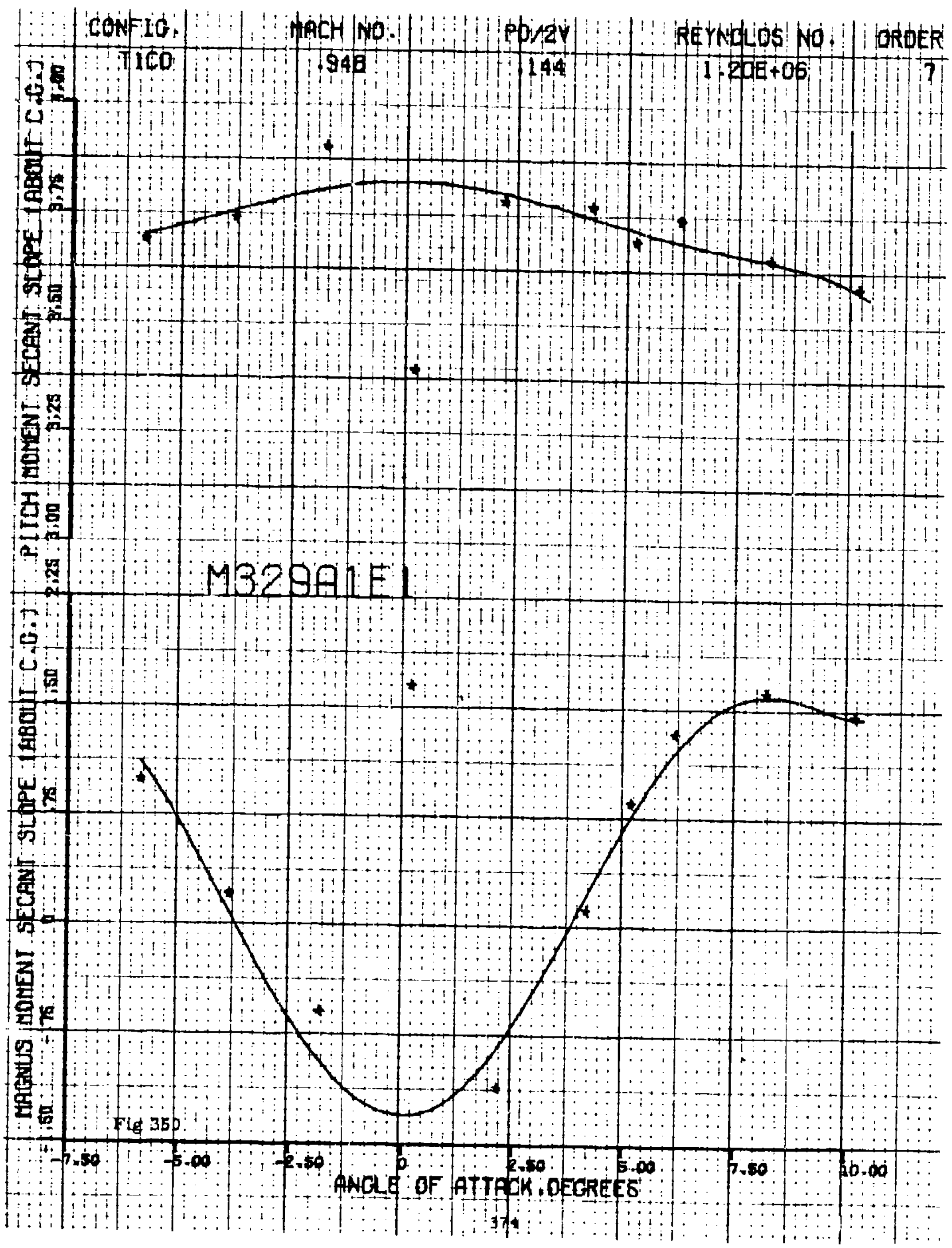
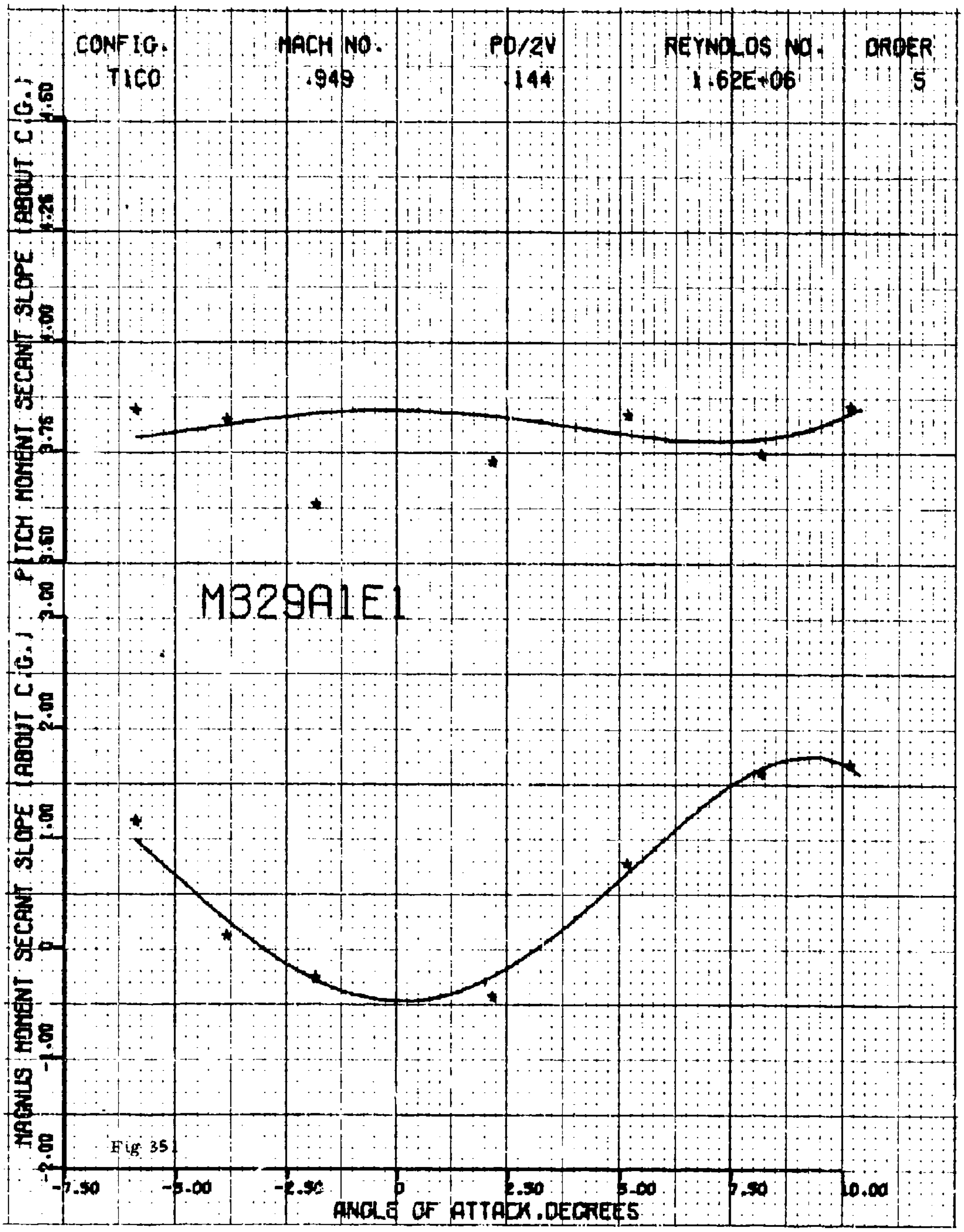
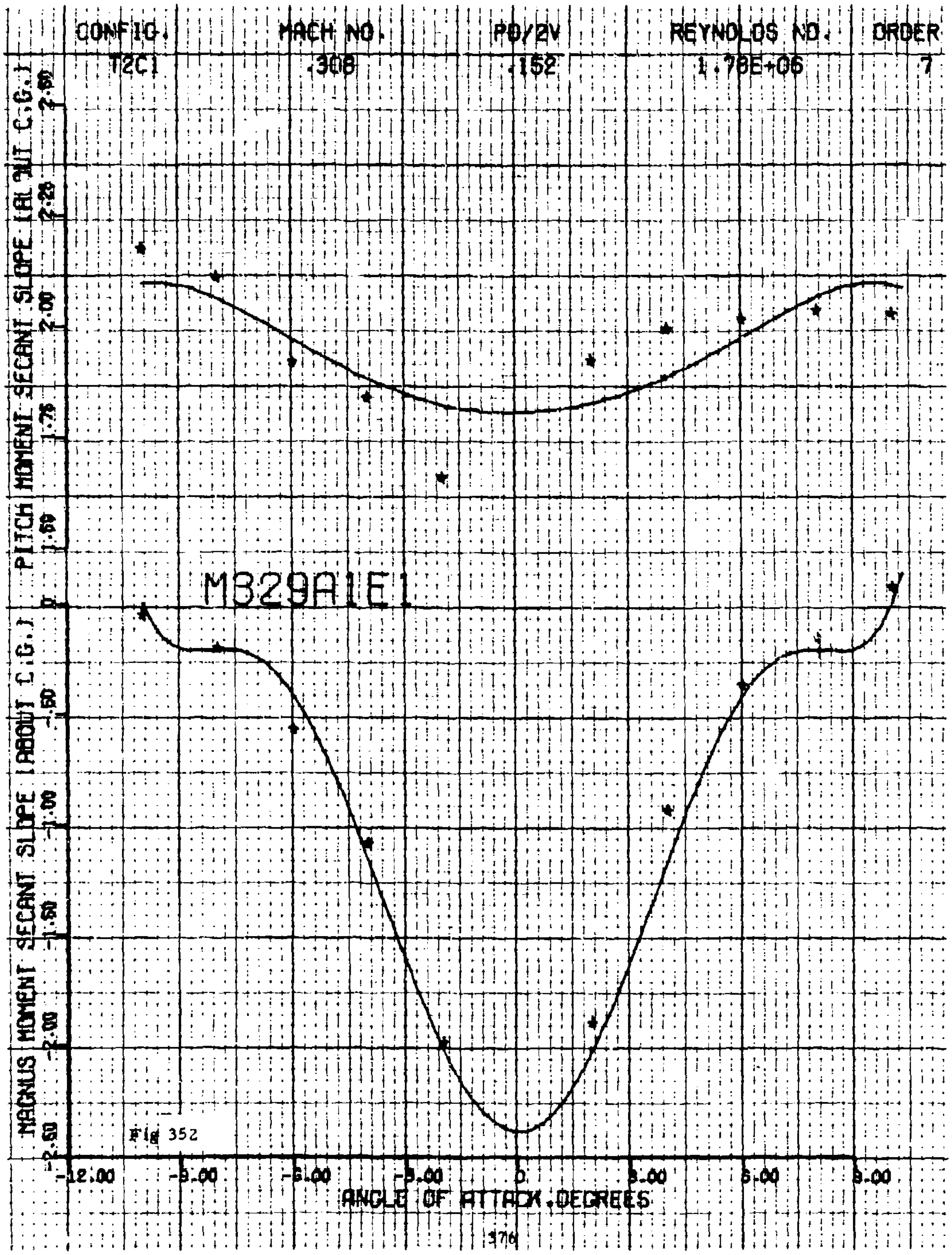
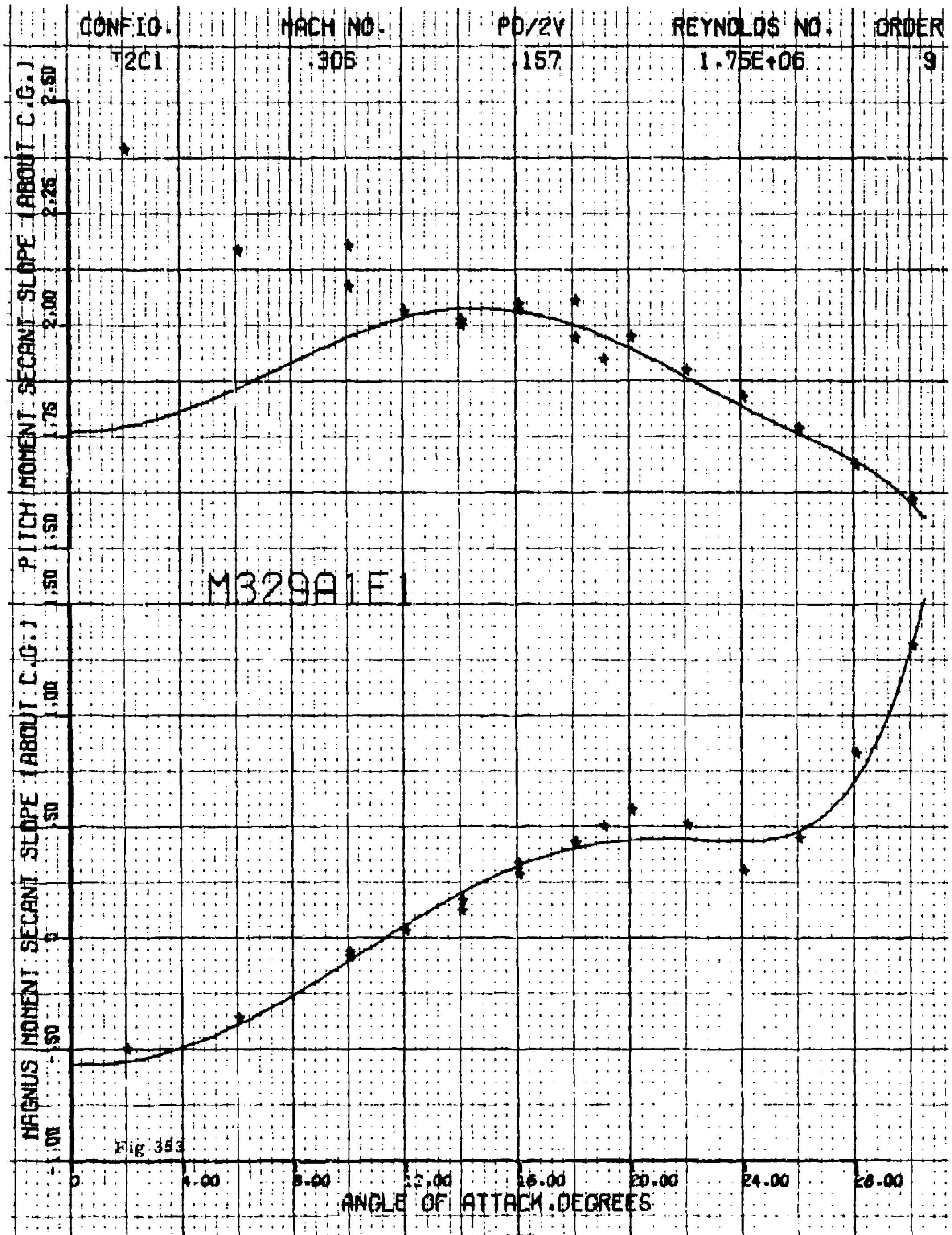

CONFIG.
TICO
MACH NO.
.948
PD/2V
.144
REYNOLDS NO.
1.20E+06
ORDER
7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00
ANGLE OF ATTACK,DEGREES

Fig 35D

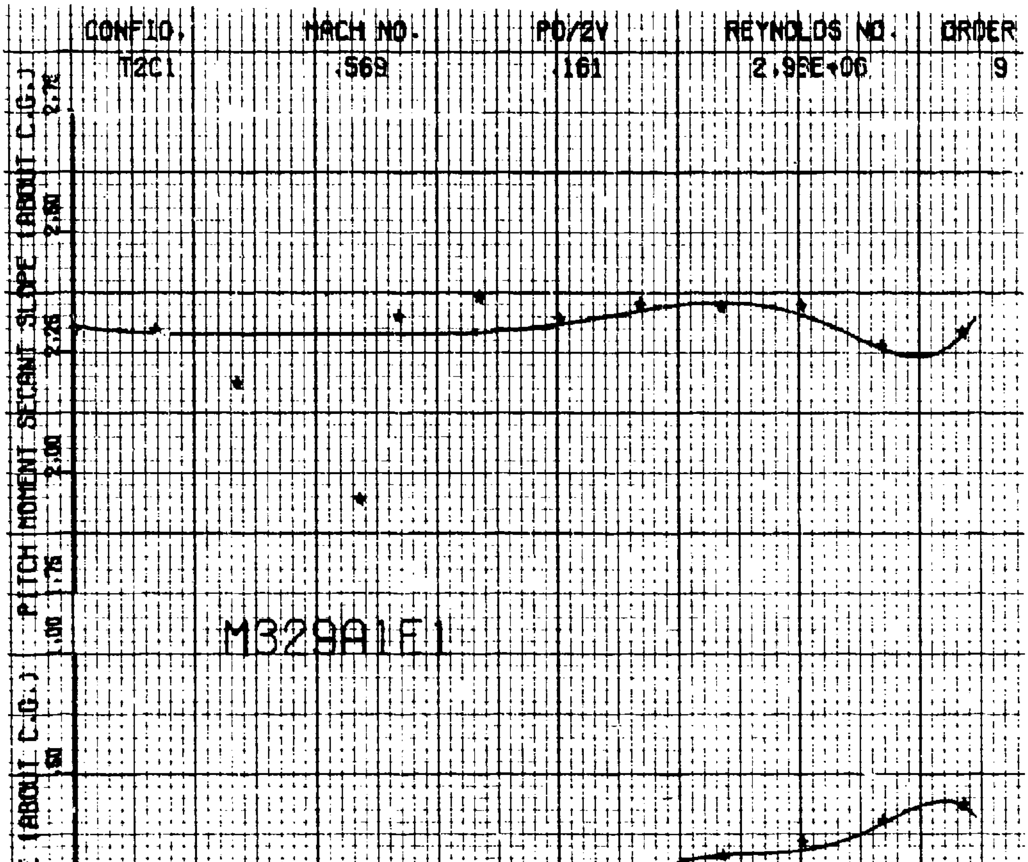

CONFIG.
TICO
MACH NO.
.949
PD/2V
144
REYNOLDS NO.
1.62E+06
ORDER
5
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
Fig 35
ANGLE OF ATTACK,DEGREES
-7.50
-5.00
-2.50
0
2.50
5.00
7.50
10.00


CONFIG.
T2C1
MACH NO.
.308
PD/2V
.152
REYNOLDS NO.
1.78E+06
ORDER
7
M329A1E1
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
ANGLE OF ATTACK, DEGREES
-12.00
-9.00
-6.00
-3.00
0
3.00
6.00
9.00
2.50
2.25
2.00
1.75
1.50
0
-.50
-1.00
-1.50
-2.00
-2.50
Fig 352



CONFIG.
T2C1
MACH NO.
.306
PD/2V
.157
REYNOLDS NO.
1.75E+06
ORDER
9
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1F1
ANGLE OF ATTACK,DEGREES

Fig 353



CONFIG. MACH NO. PD/2V REYNOLDS NO. ORDER
T2C1 .569 .161 2.92E+06 9
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
2.75
2.50
2.25
2.00
1.75
1.00
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
.50
0
-.50
-1.00
-1.50
M329A1E1
Fig 354
-5.00
-3.00
0
3.00
6.00
9.00
12.00
15.00
ANGLE OF ATTACK,DEGREES

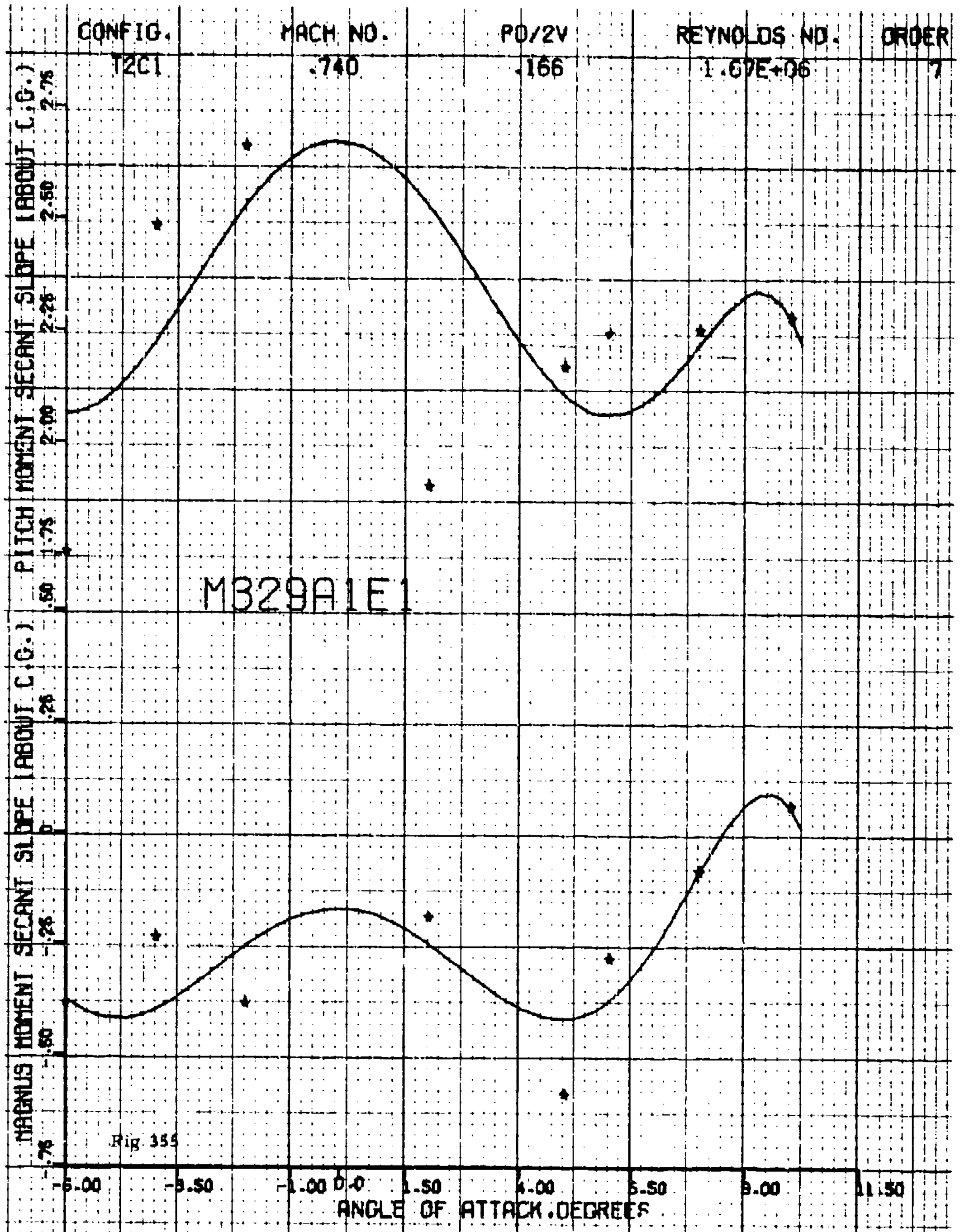
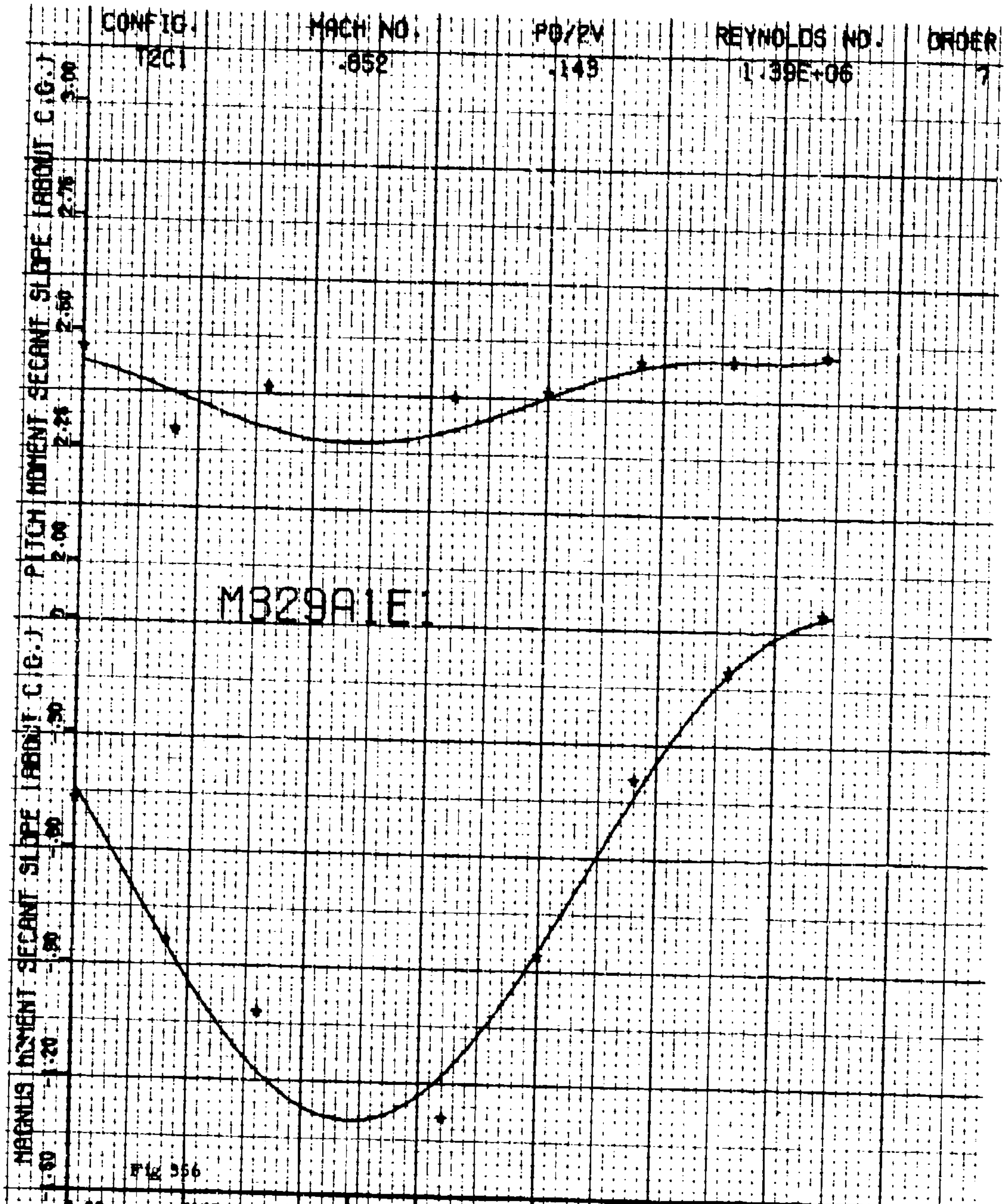
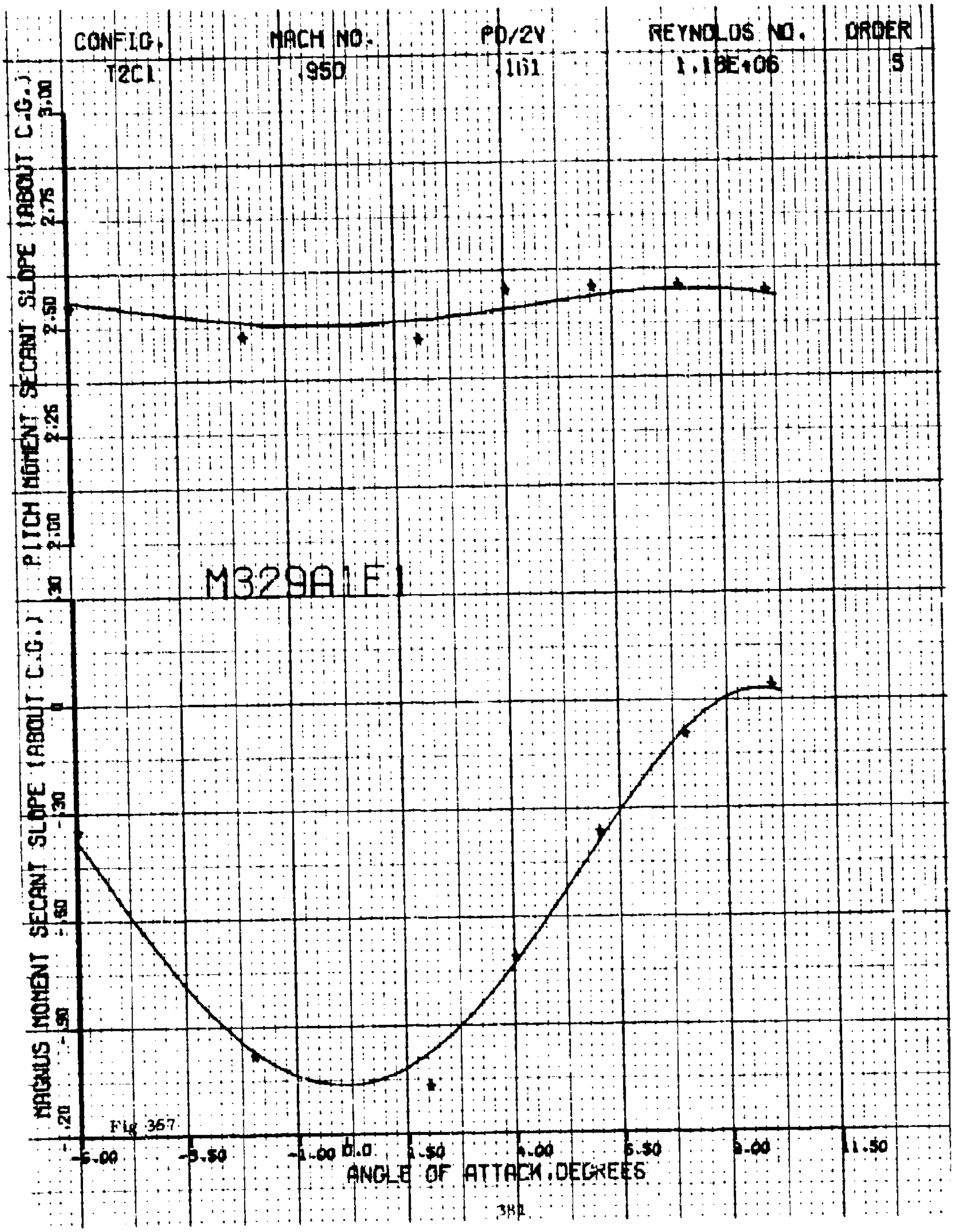

CONFIG. T2C1
MACH NO. .740
PD/2V .166
REYNOLDS NO. 1.67E+06
ORDER 7
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1E1
ANGLE OF ATTACK,DEGREES

Fig. 355



CONFIG.
T2C1
MACH NO.
.852
PD/2V
.143
REYNOLDS NO.
1.39E+06
ORDER
7
M329A1E1
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
ANGLE OF ATTACK,DEGREES
-5.00
-1.00
0.0
1.50
4.00
6.50
9.00
11.50
Fig 356



CONFIG. T2C1
MACH NO. .950
PD/2V .161
REYNOLDS NO. 1.18E+06
ORDER 5
PITCH MOMENT SECANT SLOPE (ABOUT C.G.)
MAGNUS MOMENT SECANT SLOPE (ABOUT C.G.)
M329A1F1
ANGLE OF ATTACK, DEGREES

Fig 367

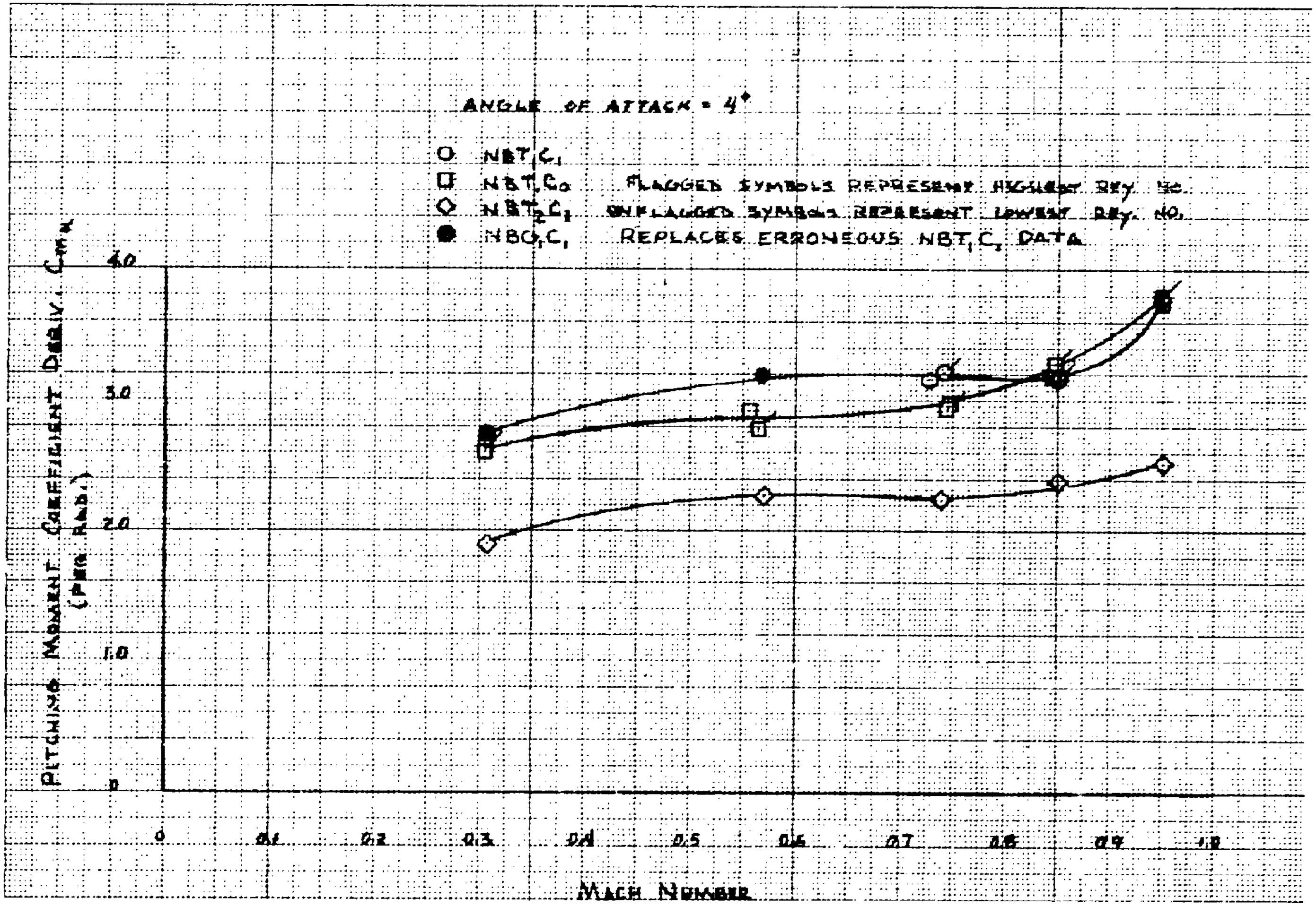


Fig 358 Pitching moment coefficient derivative vs Mach No.
(NBT_1C_1, NBT_1C_0, NBT_2C_1, NBG_iC_1)

Figures 359 and 360

Magnus moment coefficient derivative vs Mach No.
(NBT_1C_1, NBT_1C_0, NBT_2C_1)

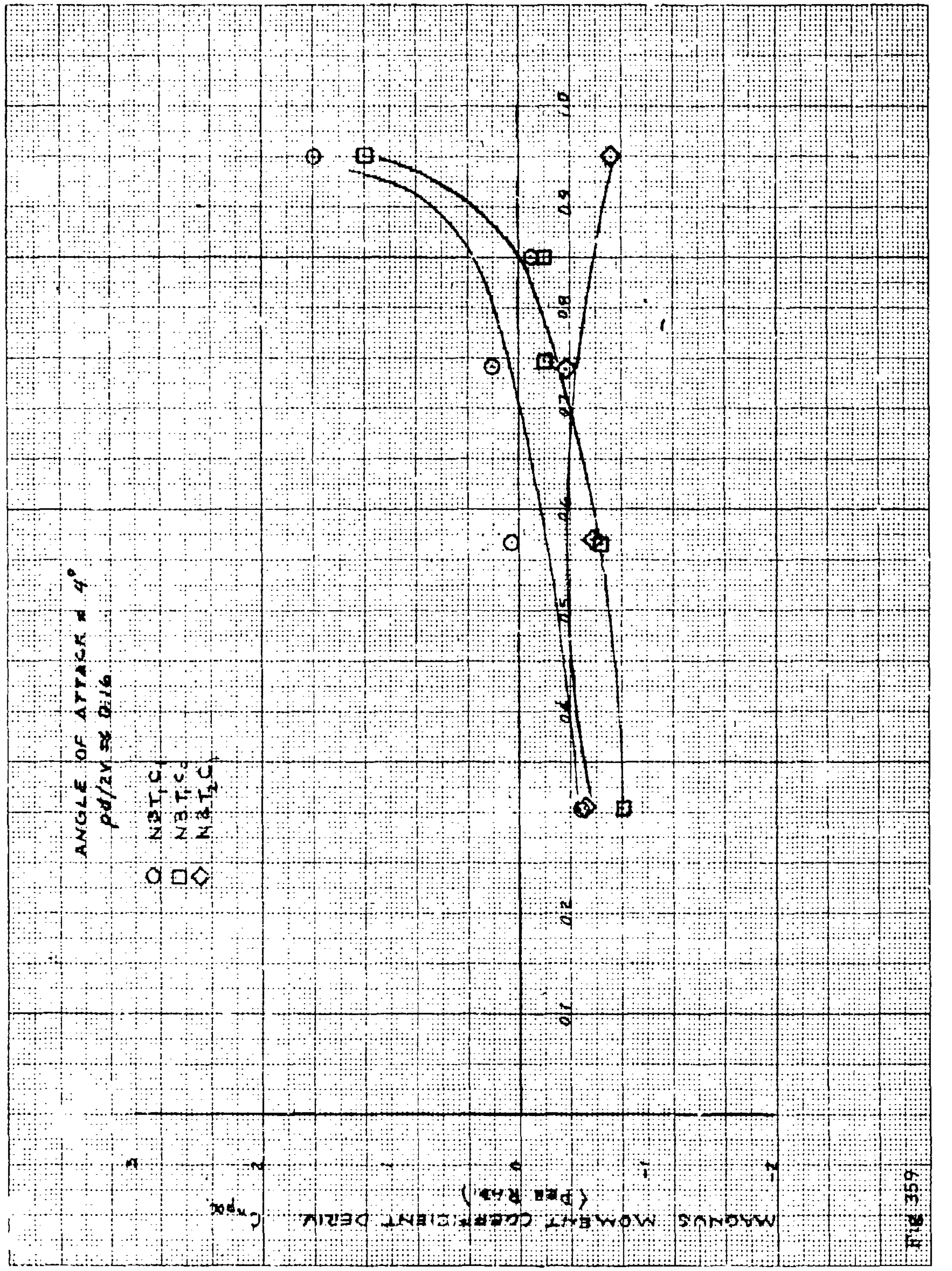

ANGLE OF ATTACK ≈ 4°
pd/2V ≈ 0.16
N3T₁C₁
N3T₁C₂
N4T₂C₁
MAGNUS MOMENT COEFFICIENT DERIV. $C_{n_{p\alpha}}$
(PER RAD.)
0.1
0.2
0.4
0.5
0.6
0.7
0.8
0.9
1.0
2
1
0
-1
-2

FIG. 359

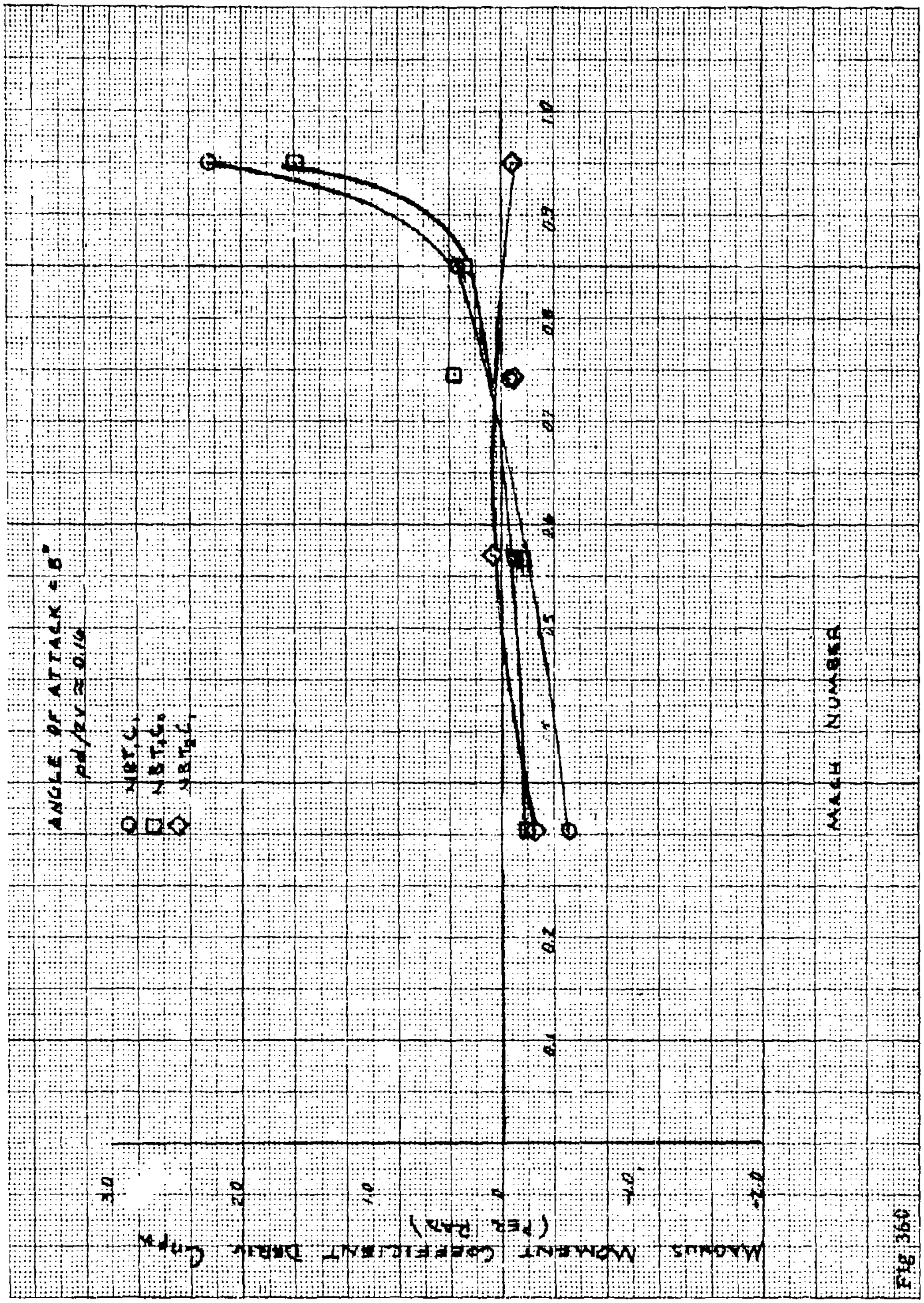

ANGLE OF ATTACK = 8°
MACH NUMBER
MAGNUS MOMENT COEFFICIENT DERIV.
(PER RAD)
0.1
0.2
0.5
0.6
0.7
0.8
0.9
1.0
3.0
2.0
1.0
0

Fig 36-C

Figures 361 through 367

Magnus moment coefficient derivative vs pd/2V
(NBT_1C_1)

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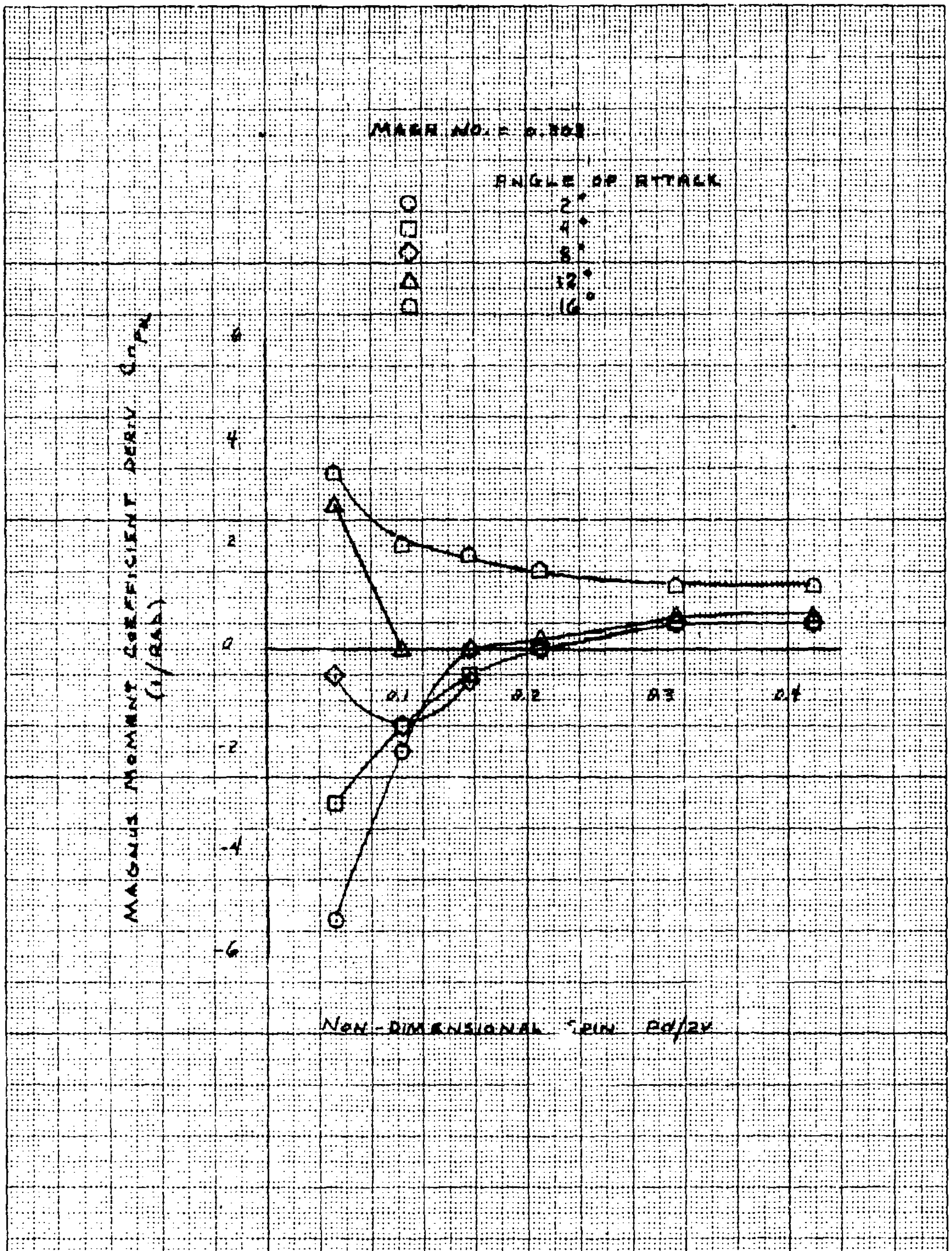

ANGLE OF ATTACK
2°
4°
8°
12°
16°
MAGNUS MOMENT COEFFICIENT DERIV.
(1/RAD)
6
4
2
0
-2
-4
-6
0.1
0.2
0.3
0.4
NON-DIMENSIONAL SPIN pd/2V

Fig 361

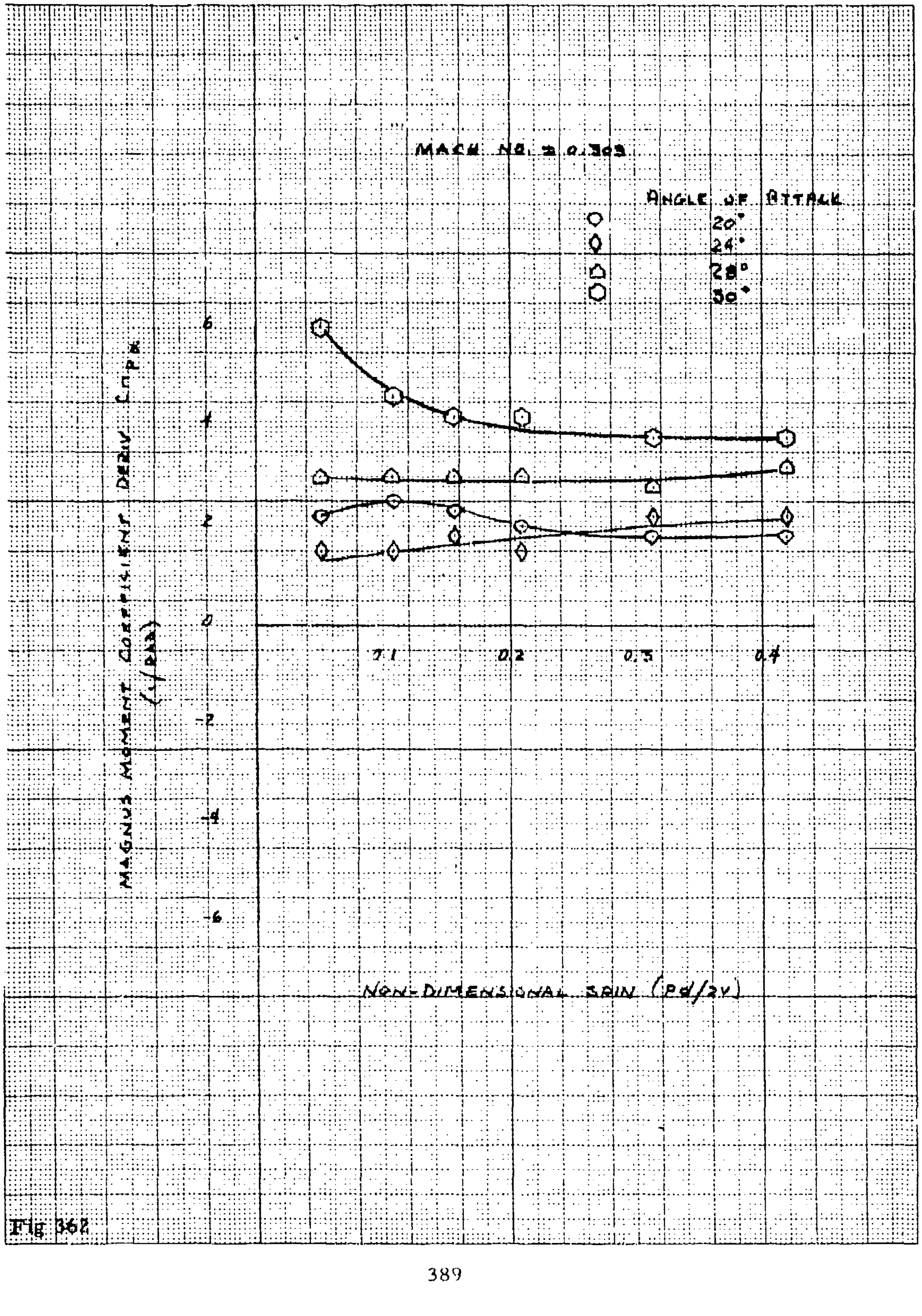

MACH NO. = 0.303
ANGLE OF ATTACK
20°
24°
28°
30°
MAGNUS MOMENT COEFFICIENT DERIV. $C_{n_{p\alpha}}$ (1/RAD)
NON-DIMENSIONAL SPIN (Pd/2V)

Fig 362

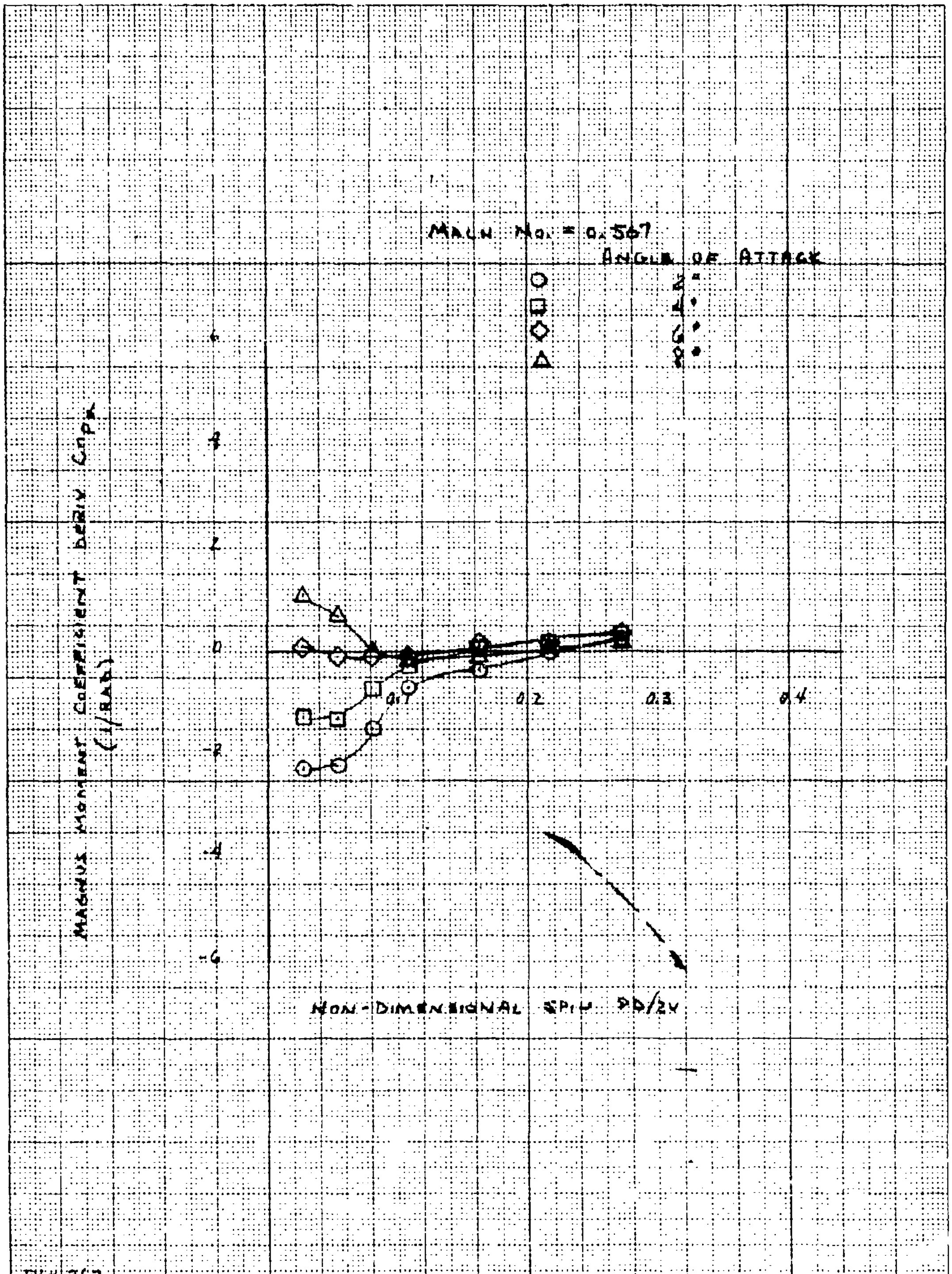
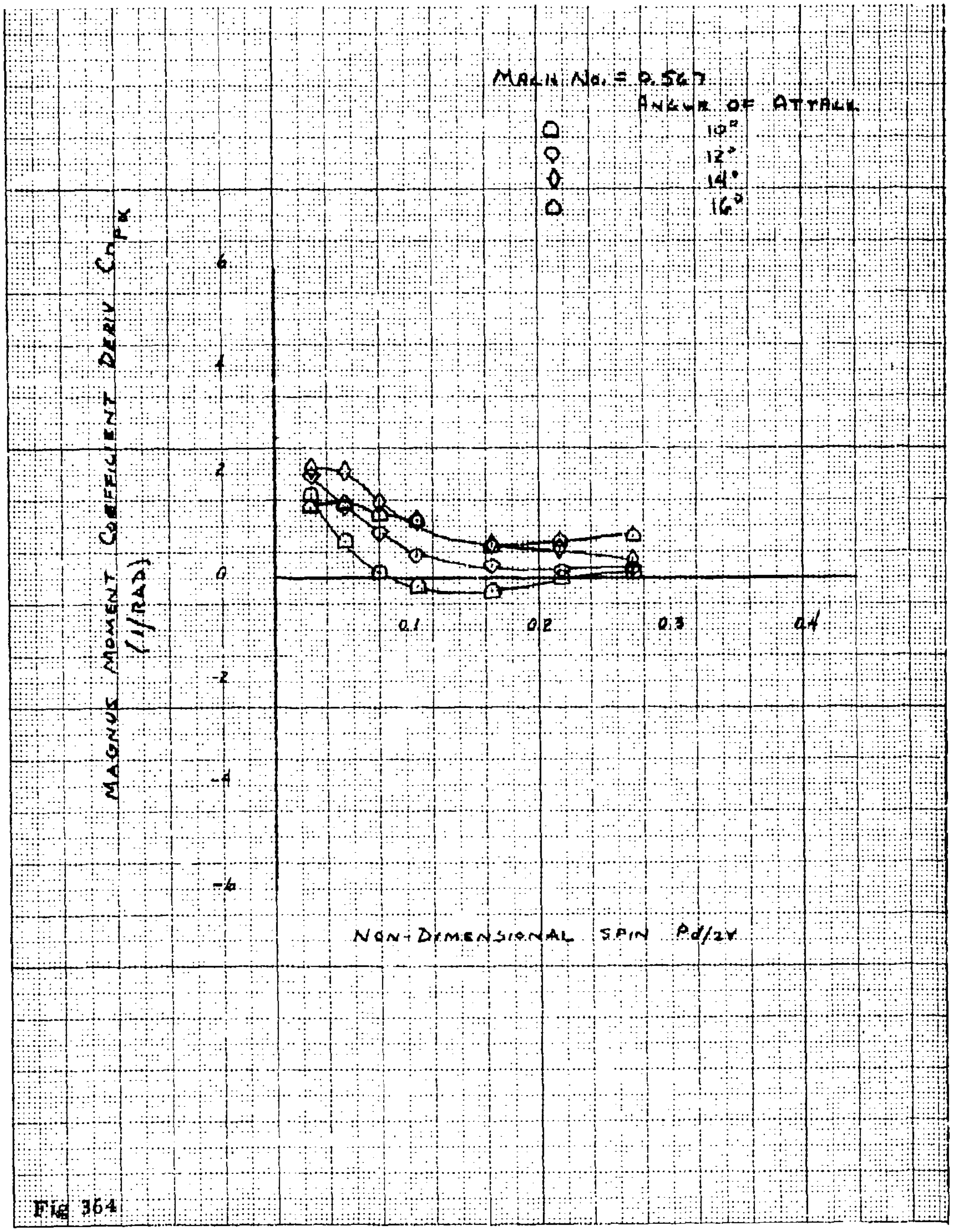

MACH NO. = 0.567
ANGLE OF ATTACK
2°
4°
6°
8°
MAGNUS MOMENT COEFFICIENT DERIV. $C_{np\alpha}$ (1/RAD)
NON-DIMENSIONAL SPIN PD/2V
6
4
2
0
-2
-4
-6
0.1
0.2
0.3
0.4

Fig 363


MACH No. = 0.567
ANGLE OF ATTACK
10°
12°
14°
16°
MAGNUS MOMENT COEFFICIENT DERIV $C_{n_{p\alpha}}$
(1/RAD)
6
4
2
0
-2
-4
-6
0.1
0.2
0.3
0.4
NON-DIMENSIONAL SPIN Pd/2V
Fig 364

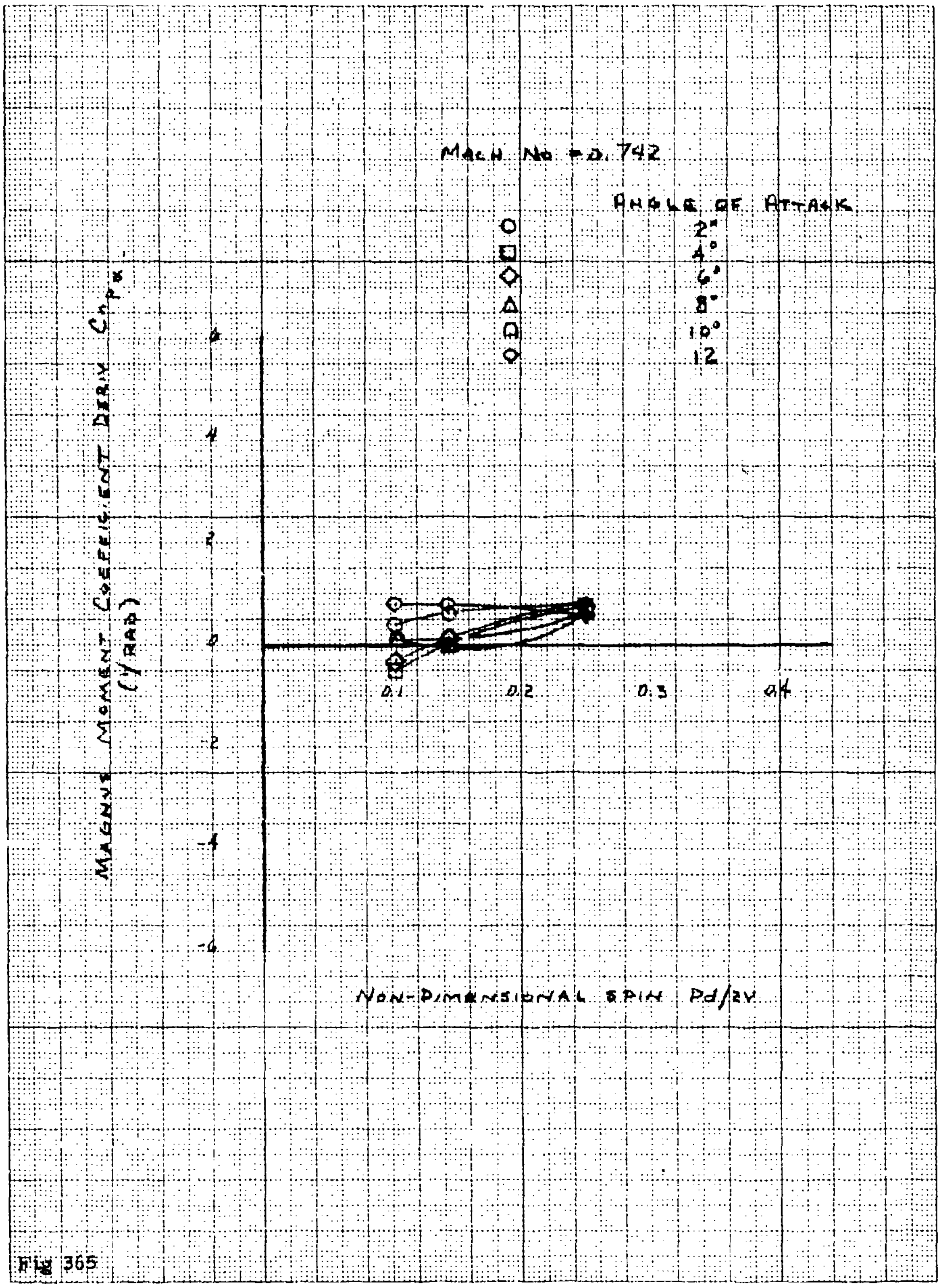

MACH No = 0.742
ANGLE OF ATTACK
2°
4°
6°
8°
10°
12
MAGNUS MOMENT COEFFICIENT DERIV $C_{n_{p\alpha}}$
(1/RAD)
4
2
0
-2
-4
0.1
0.2
0.3
0.4
NON-DIMENSIONAL SPIN Pd/2V

Fig 365

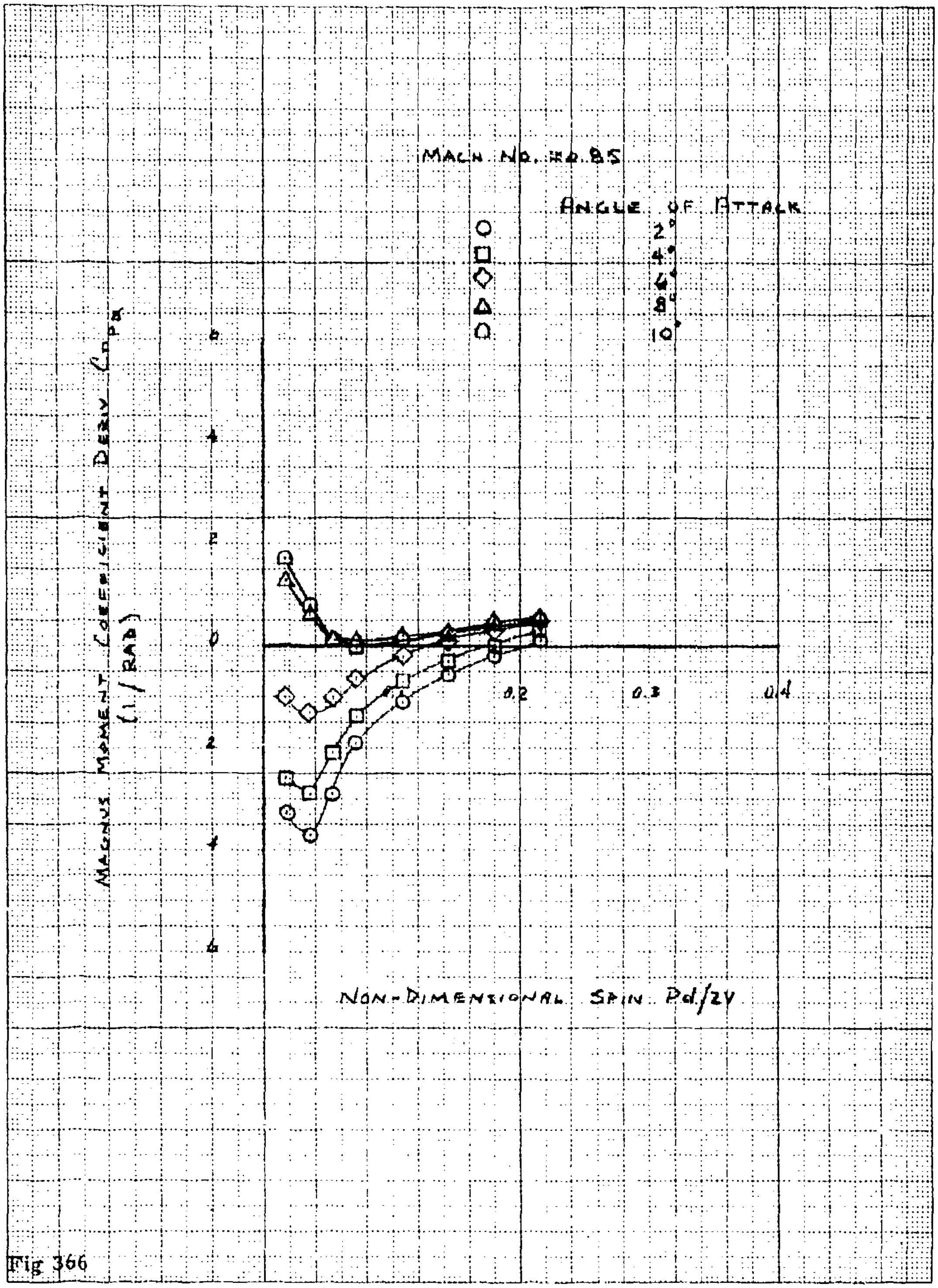

MACH NO. = 0.85
ANGLE OF ATTACK
2°
4°
6°
8°
10°
MAGNUS MOMENT COEFFICIENT DERIV $C_{n_{p\alpha}}$
(1/RAD)
6
4
2
0
2
4
6
0.2
0.3
0.4
NON-DIMENSIONAL SPIN Pd/2V

Fig 366

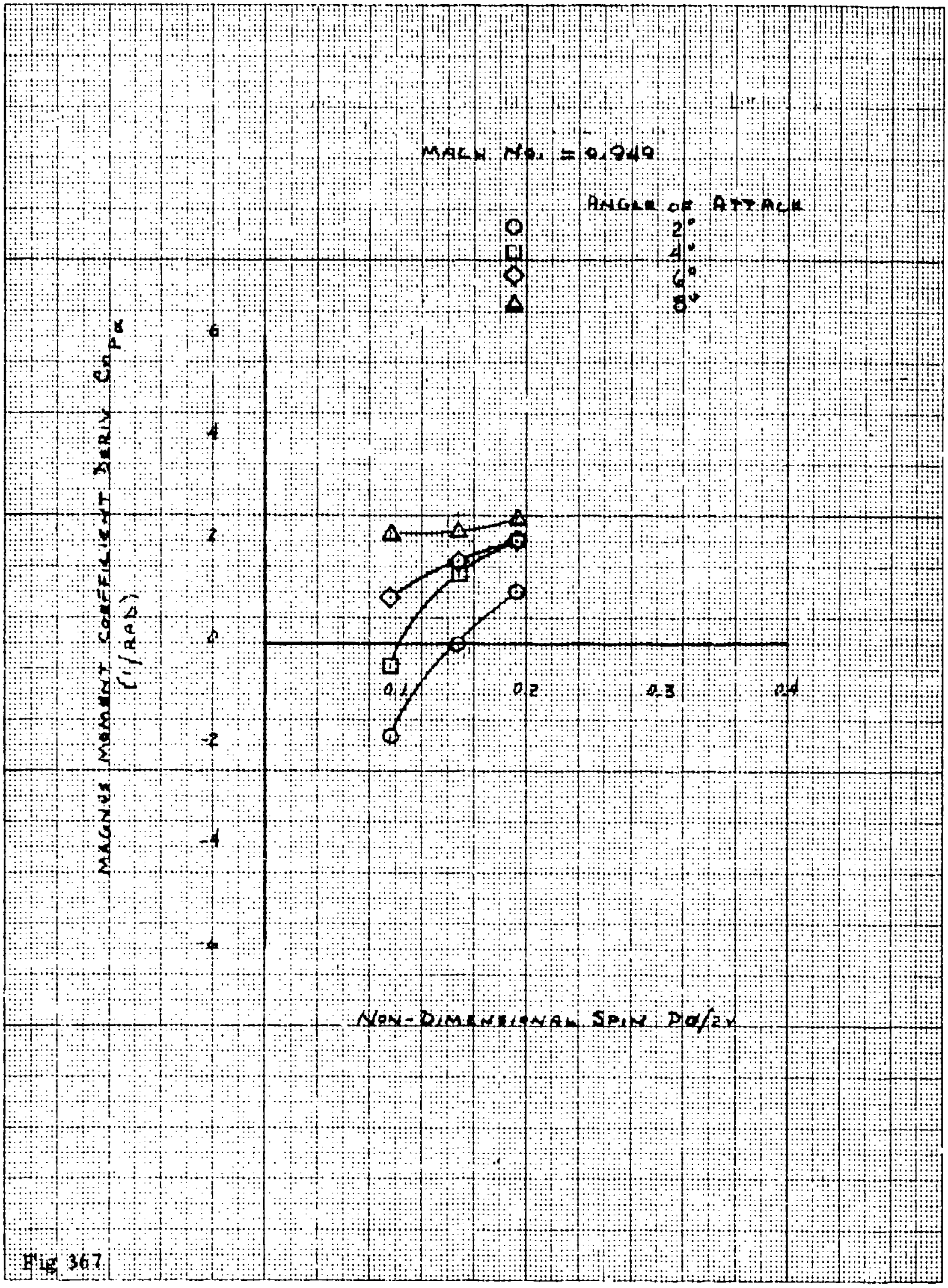
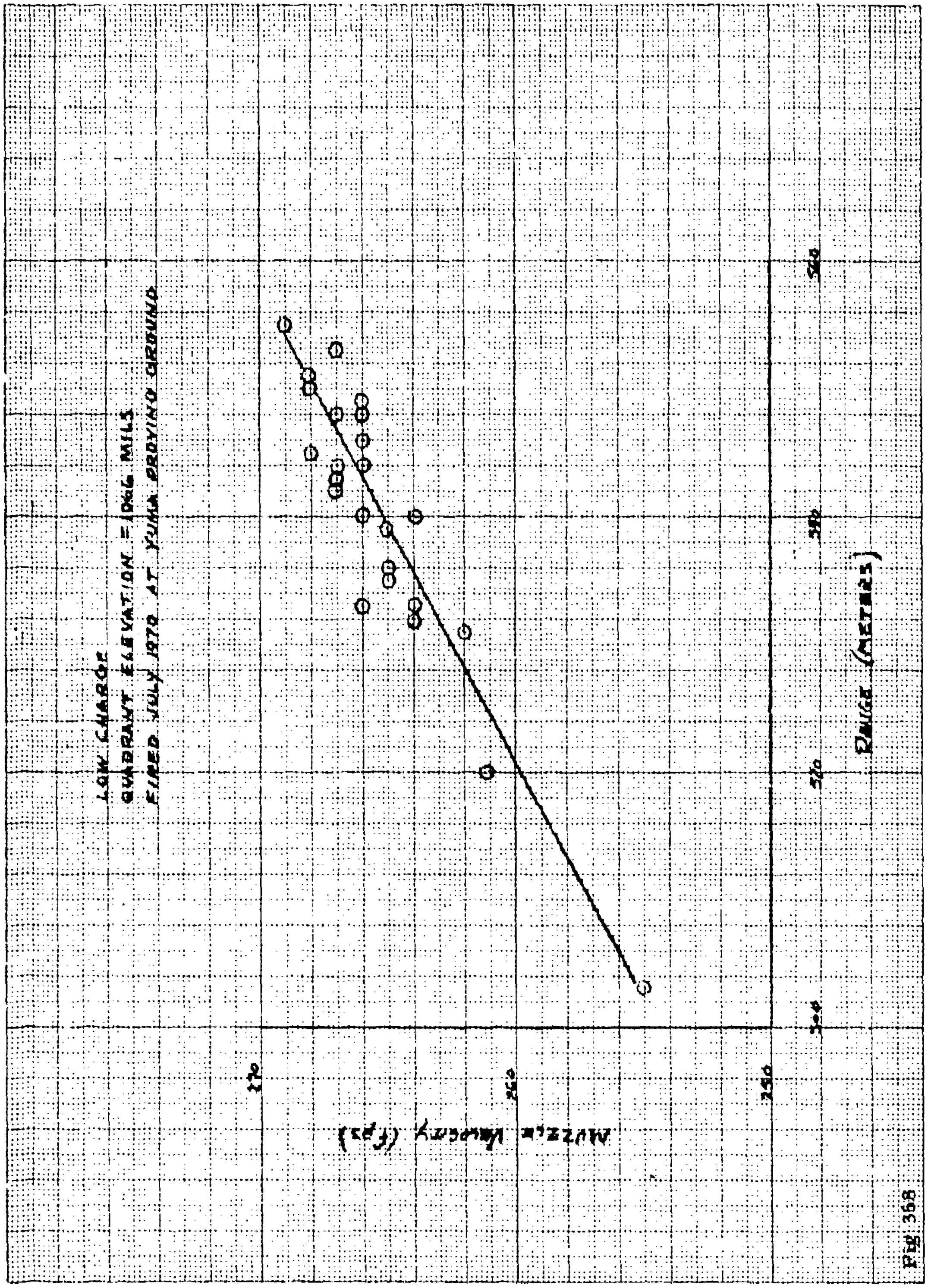

MACH NO. = 0.949
ANGLE OF ATTACK
2°
4°
6°
8°
MAGNUS MOMENT COEFFICIENT DERIV. $C_{n_{p\alpha}}$
(1/RAD)
6
4
2
0
-2
-4
-6
0.1
0.2
0.3
0.4
NON-DIMENSIONAL SPIN $pd/2V$

Fig 367

Figures 368 through 369

Muzzle velocity vs range for performance flight tests at Yuma Proving Ground


LOW CHARGE
QUADRANT ELEVATION = 1066 MILS
FIRED JULY 1970 AT YUMA PROVING GROUND
RANGE (METERS)
500
520
540
560
MUZZLE VELOCITY (FPS)
270
260
250
Fig 368

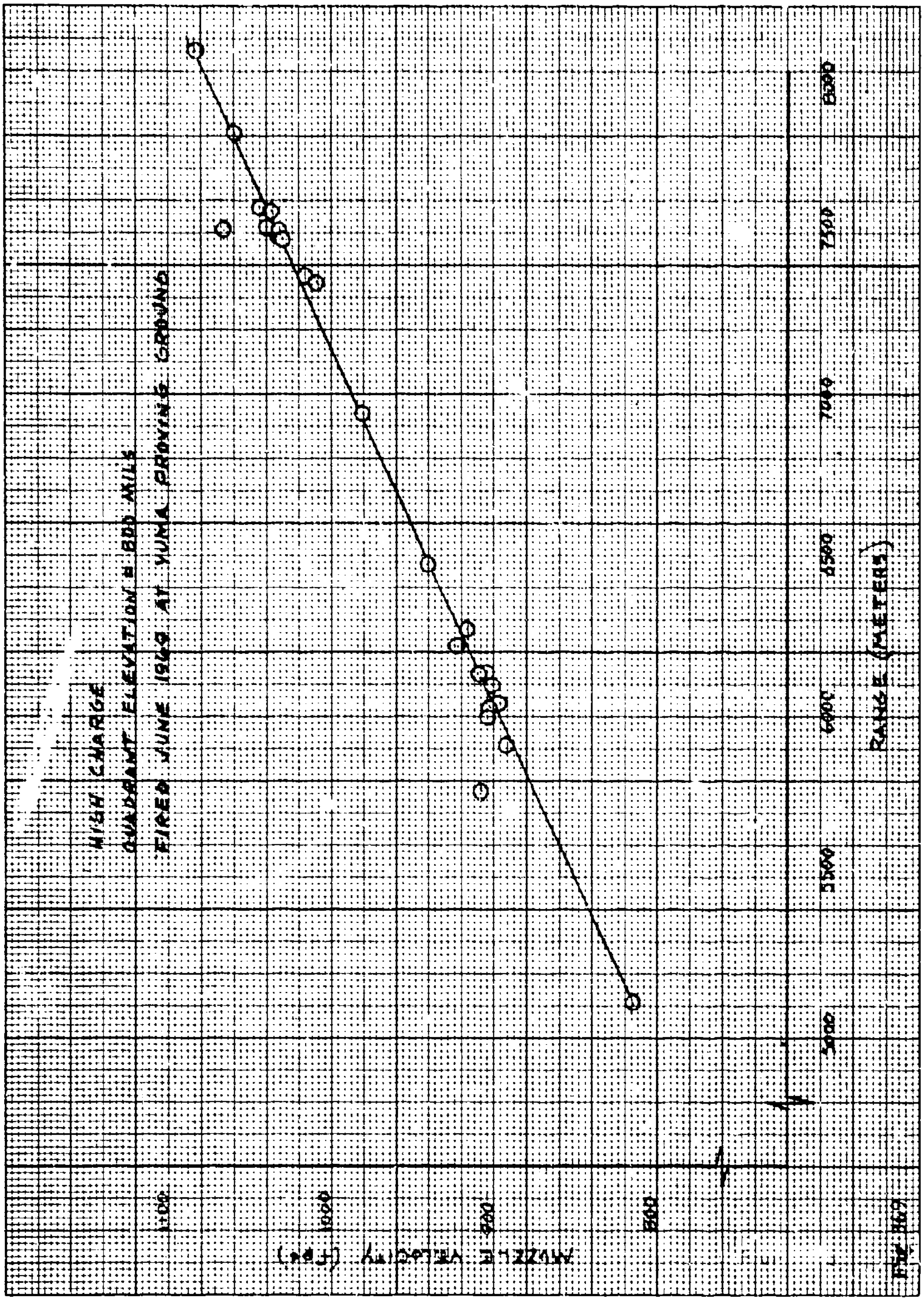

HIGH CHARGE
QUADRANT ELEVATION = 800 MILS
FIRED JUNE 1969 AT YUMA PROVING GROUND
MUZZLE VELOCITY (FPS)
1100
1000
900
800
RANGE (METERS)
5000
5500
6000
6500
7000
7500
8000

FIG 369

Figures 370 through 374

Yaw data translated from camera coverage shown in Figure 8

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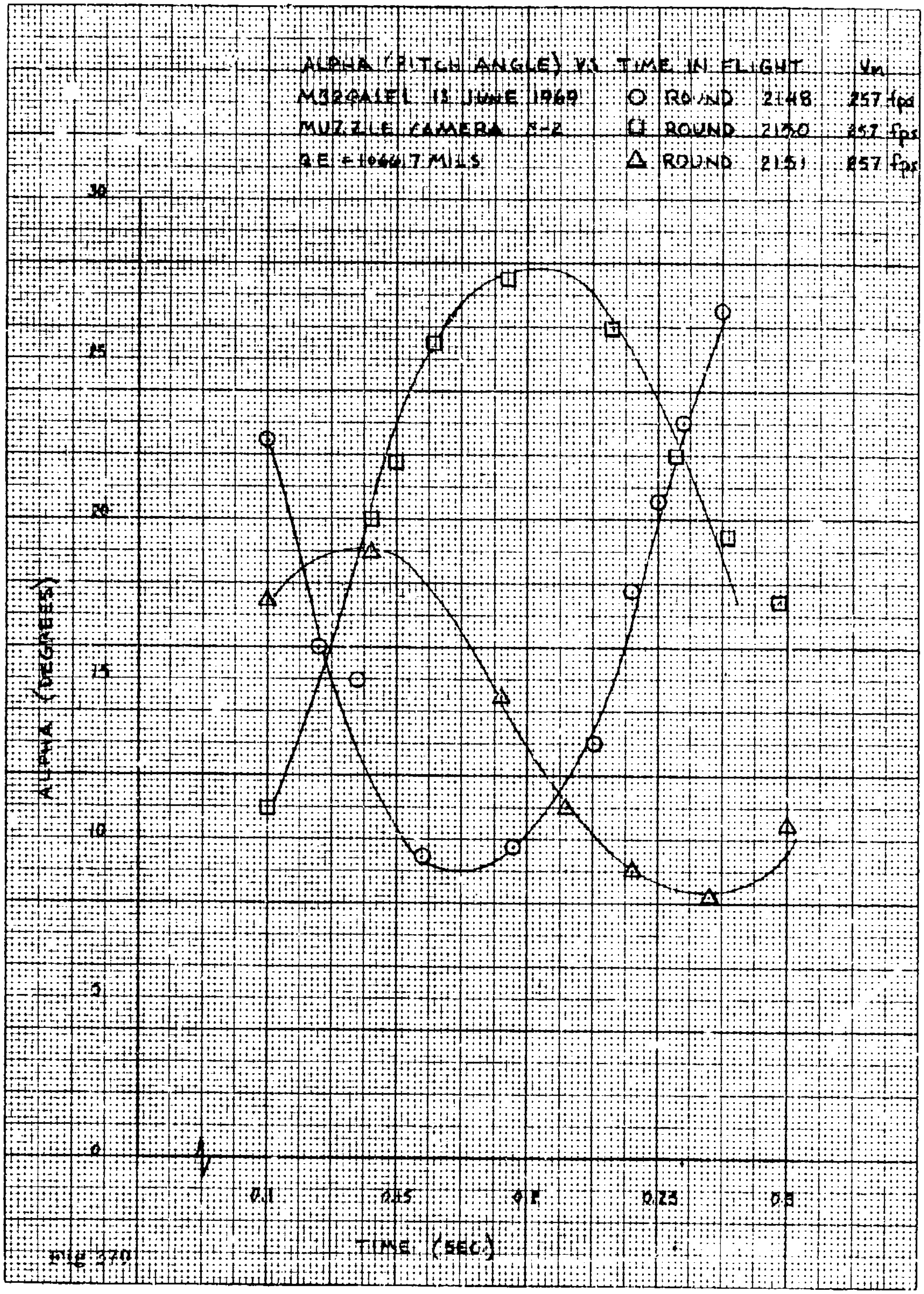
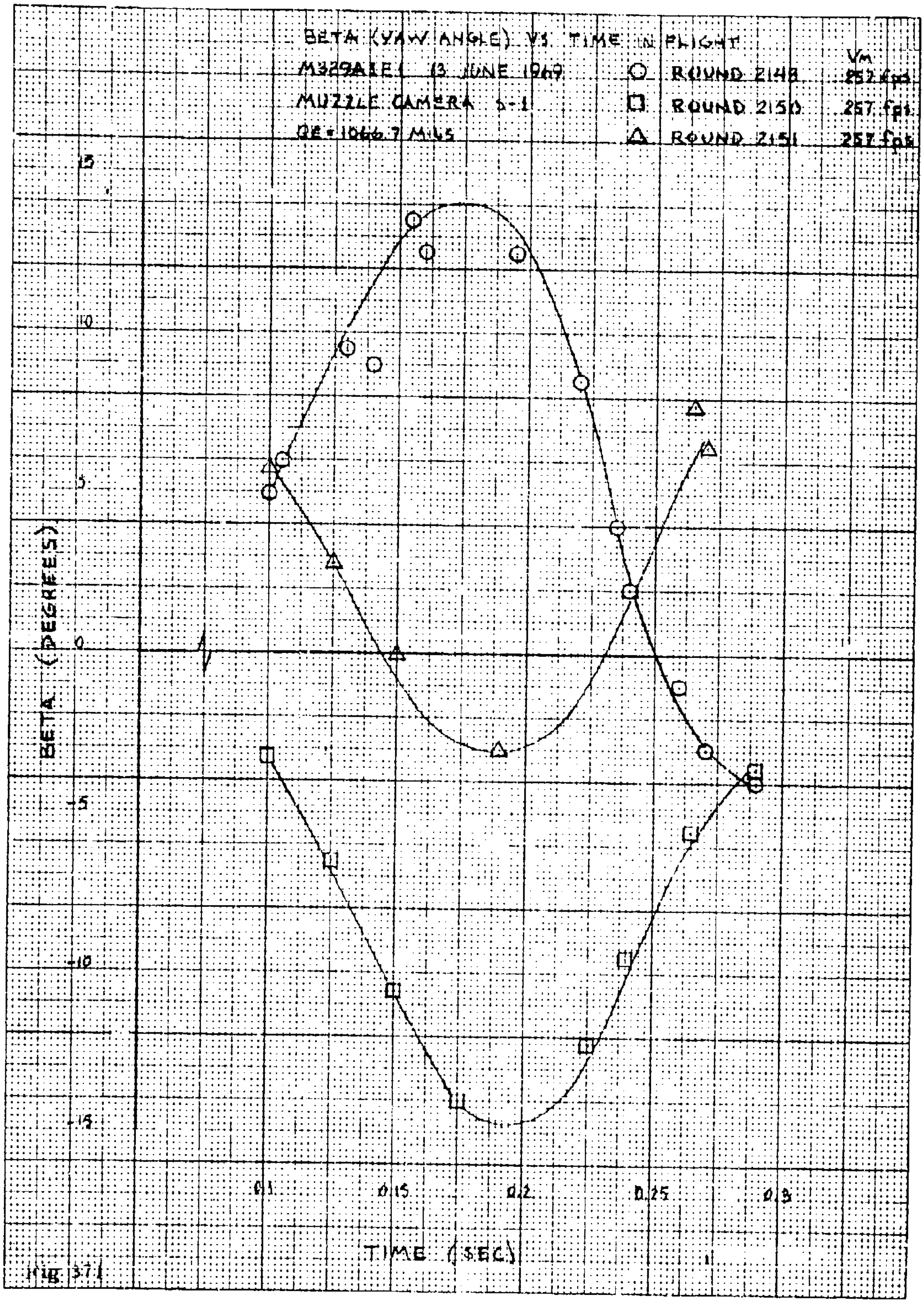

ALPHA (PITCH ANGLE) VS TIME IN FLIGHT
Vm
M324A1E1 13 JUNE 1969
MUZZLE CAMERA
○ ROUND 2148 257 fps
□ ROUND 2150 257 fps
△ ROUND 2151 257 fps
30
25
20
15
10
5
0
0.1
0.15
0.2
0.25
0.3
ALPHA (DEGREES)
TIME (SEC)



BETA (YAW ANGLE) VS TIME IN FLIGHT
M329A1E1 13 JUNE 1969
MUZZLE CAMERA S-1
QE = 1066.7 MILS
Vm
○ ROUND 2148 257 fps
□ ROUND 2150 257 fps
△ ROUND 2151 257 fps
15
10
5
0
-5
-10
-15
BETA (DEGREES)
0.1
0.15
0.2
0.25
0.3
TIME (SEC)

Fig 37.1

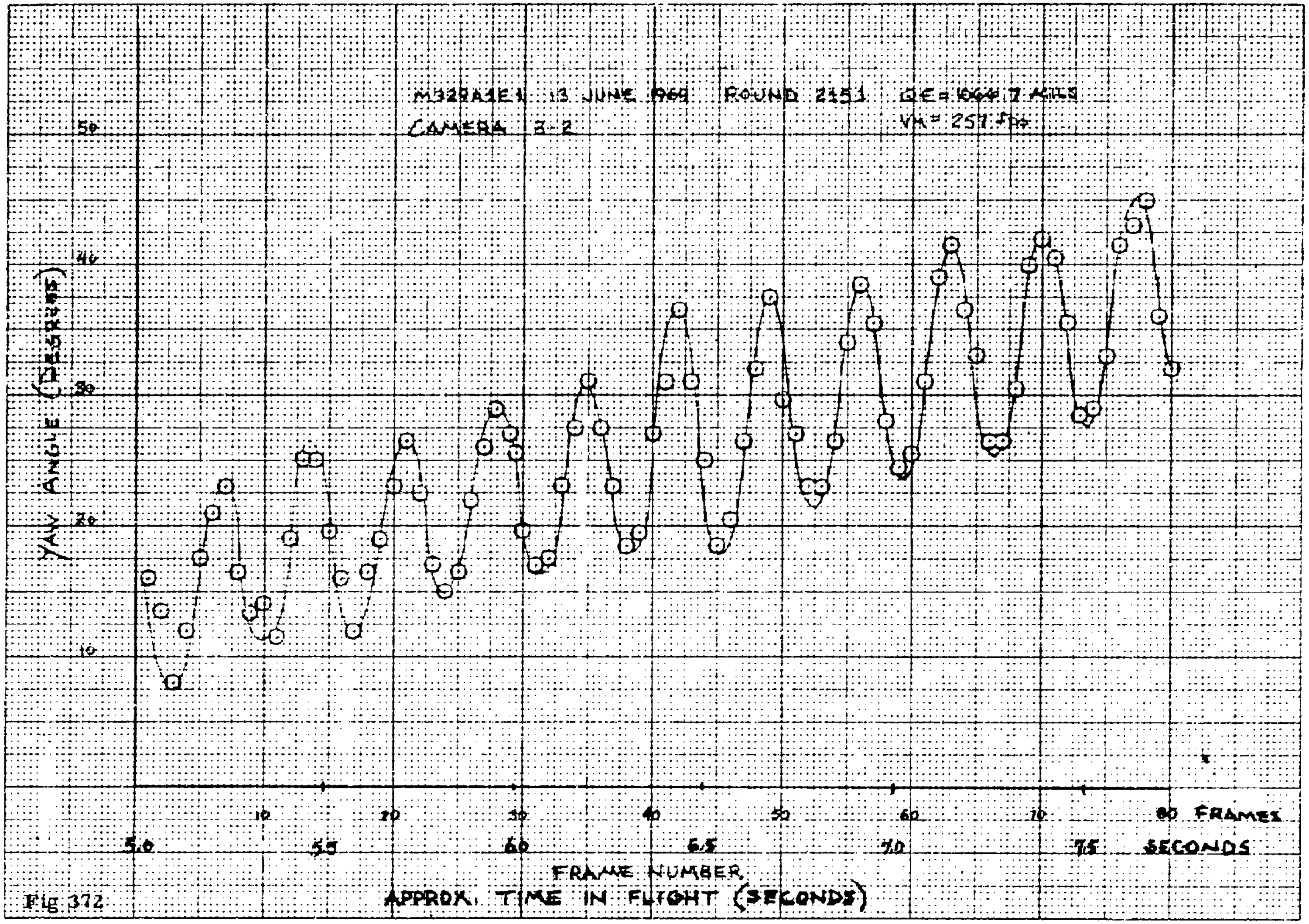
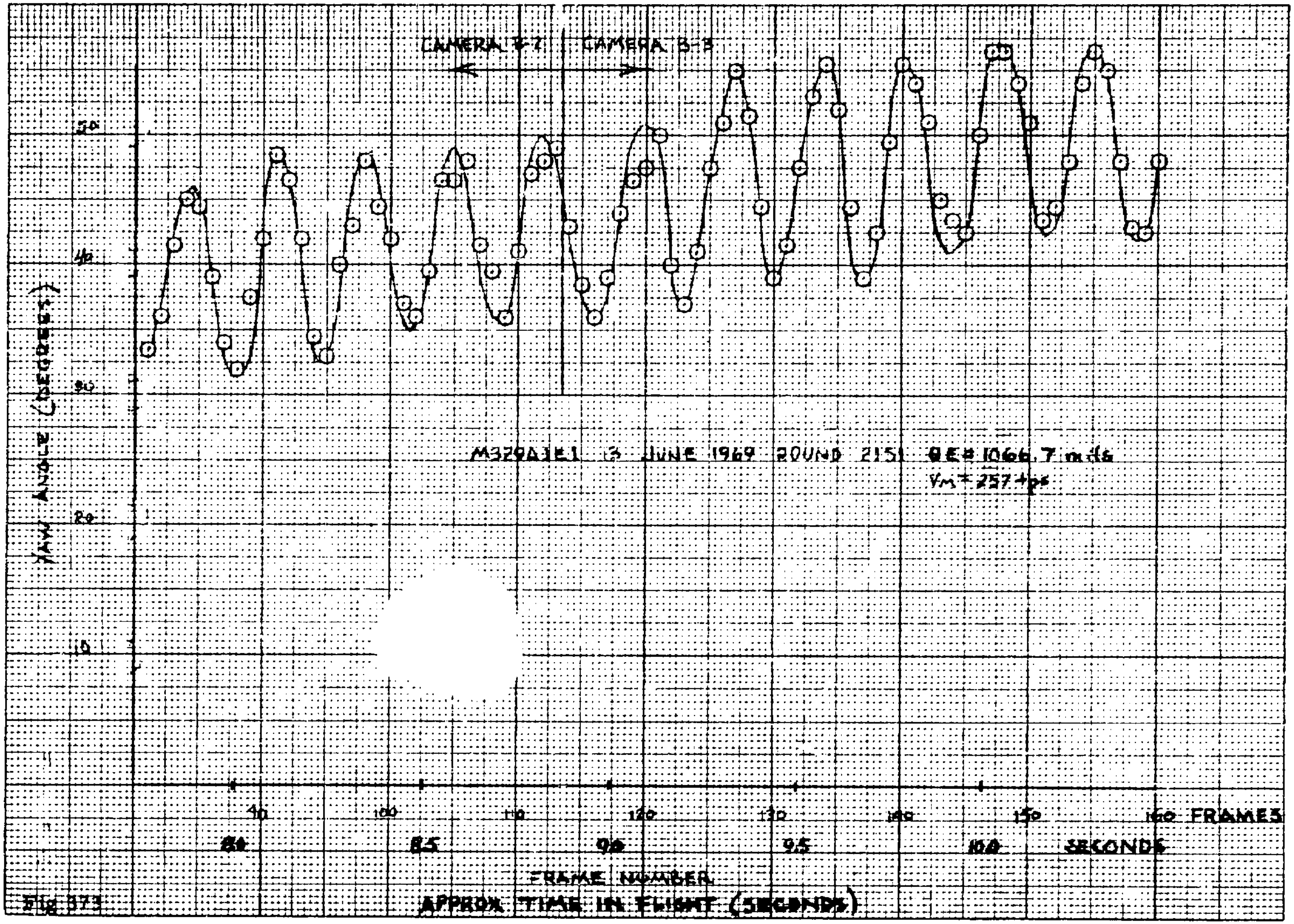

M329A1E1 13 JUNE 1969 ROUND 2151
CAMERA 3-2
YAW ANGLE (DEGREES)
50
40
30
20
10
10
20
30
40
50
60
70
80 FRAMES
5.0
5.5
6.0
6.5
7.0
7.5
SECONDS
FRAME NUMBER
APPROX. TIME IN FLIGHT (SECONDS)

Fig 372


CAMERA T-7
CAMERA B-3
YAW ANGLE (DEGREES)
50
40
30
20
10
M329A1E1 3 JUNE 1969 ROUND 2151 QE# 1066.7 mils
Vm = 257 fps
90
100
110
120
130
140
150
160 FRAMES
8.0
8.5
9.0
9.5
10.0
SECONDS
FRAME NUMBER
APPROX TIME IN FLIGHT (SECONDS)
Fig 373

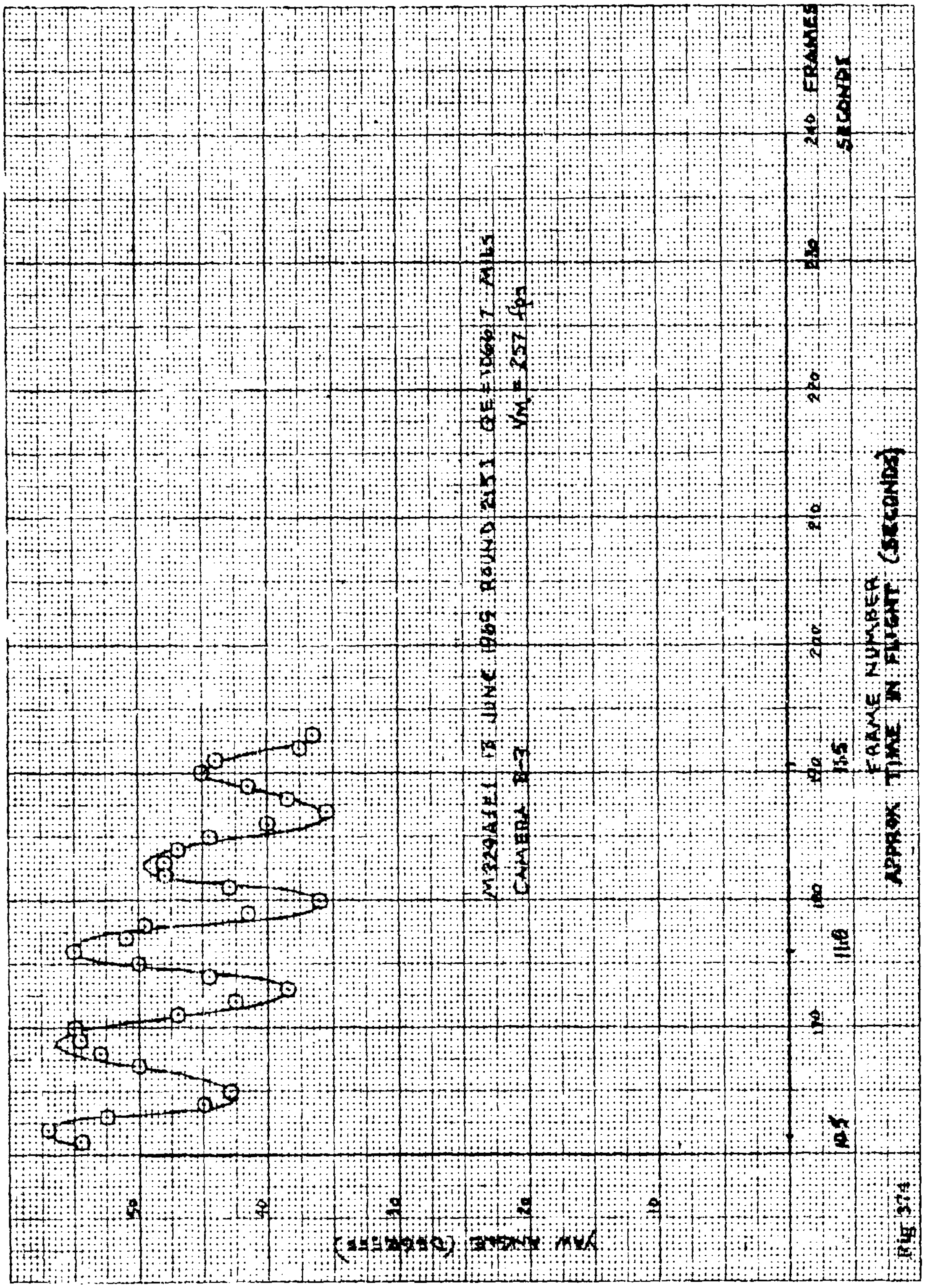

M329A1E1 17 JUNE 1969 ROUND 2151 QE = 1066.7 MILS
CAMERA B-3
VM = 257 fps
YAW ANGLE (DEGREES)
50
40
30
20
10
170
180
190
200
210
220
230
240 FRAMES
105
110
115
SECONDS
FRAME NUMBER
APPROX TIME IN FLIGHT (SECONDS)
Fig 374

Fig 375   M329A1E1 projectile fired at low charge, with obturator still attached

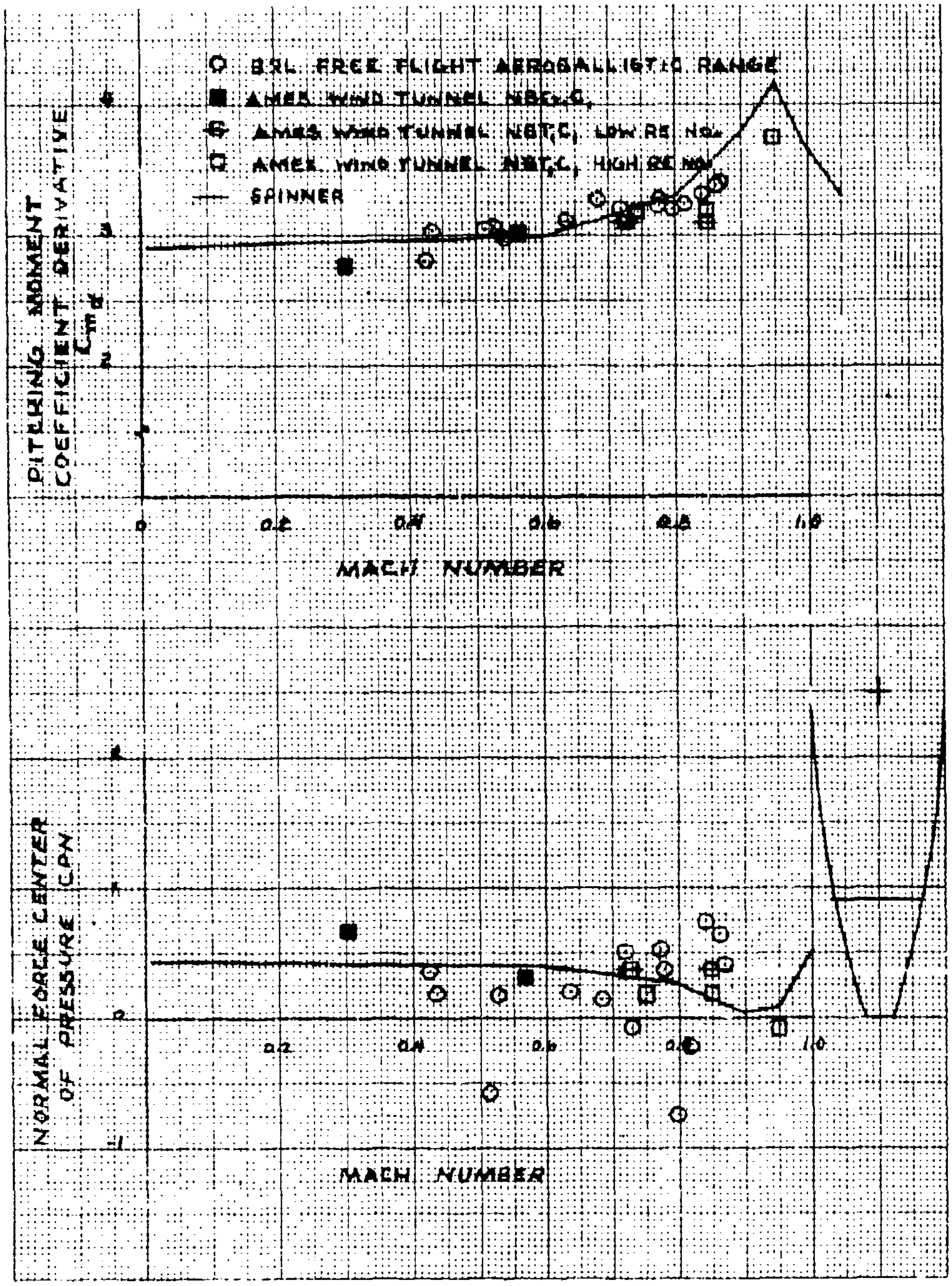


Fig 376 Pitching moment coefficient derivative and normal force center of pressure vs Mach No. (SPINNER and the BRL Transonic Range) (NBG_1C_1, NBT_1C_1)

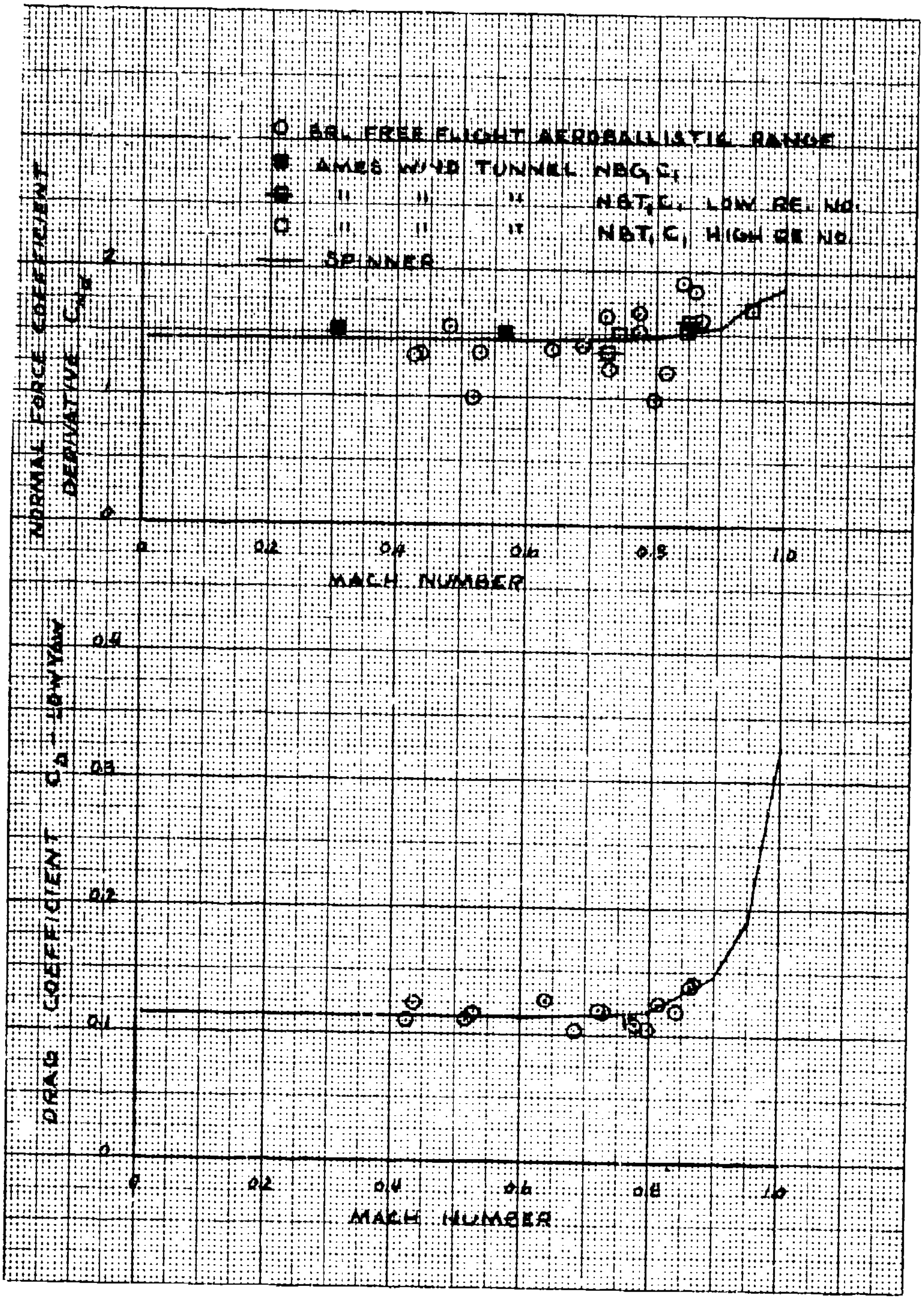


Fig 377 Normal force coefficient derivative and drag coefficient vs Mach No. (SPINNER and the BRL Transonic Range)

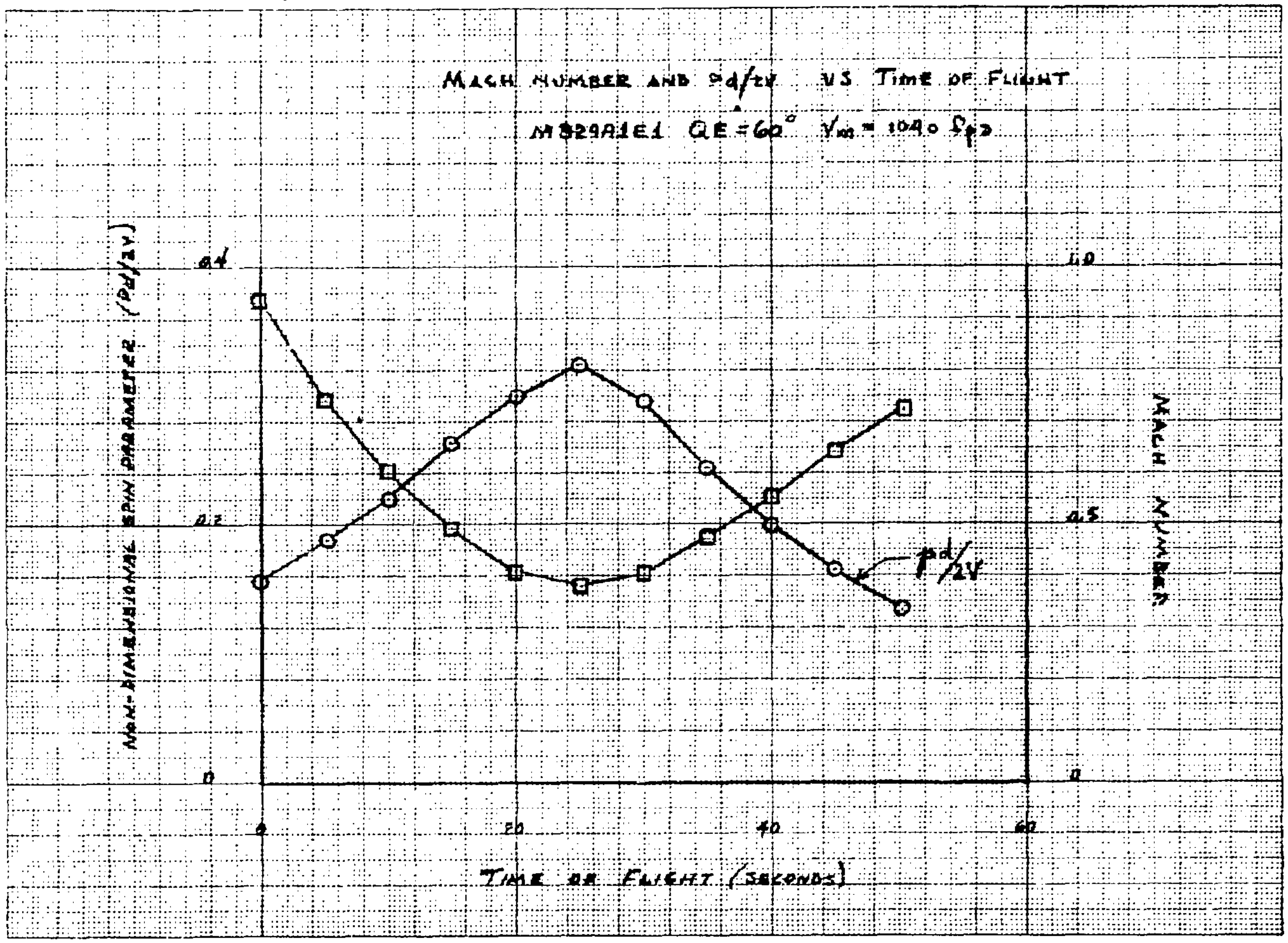


Fig 378 Mach No. and pd/2V vs time of flight for M329A1E1 six-degree of freedom trajectory computer simulations. (QE = 60°, V_{muzzle} = 1040 fps)

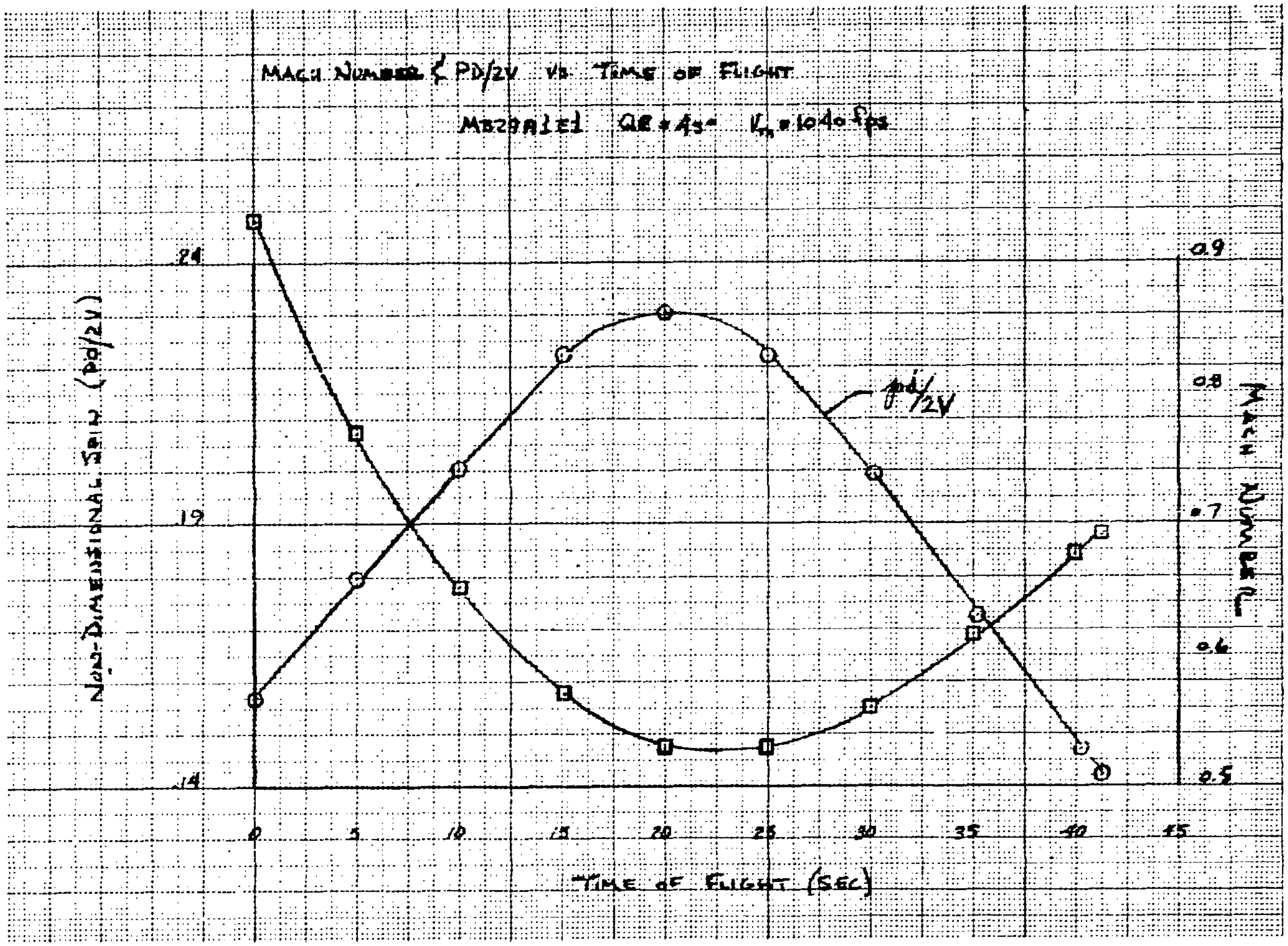


Fig 379 Mach No. and pd/2V vs time of flight for M329A1E1 six-degree of freedom trajectory computer simulations. (QE = 45°, V_{muzzle} = 1040 fps)

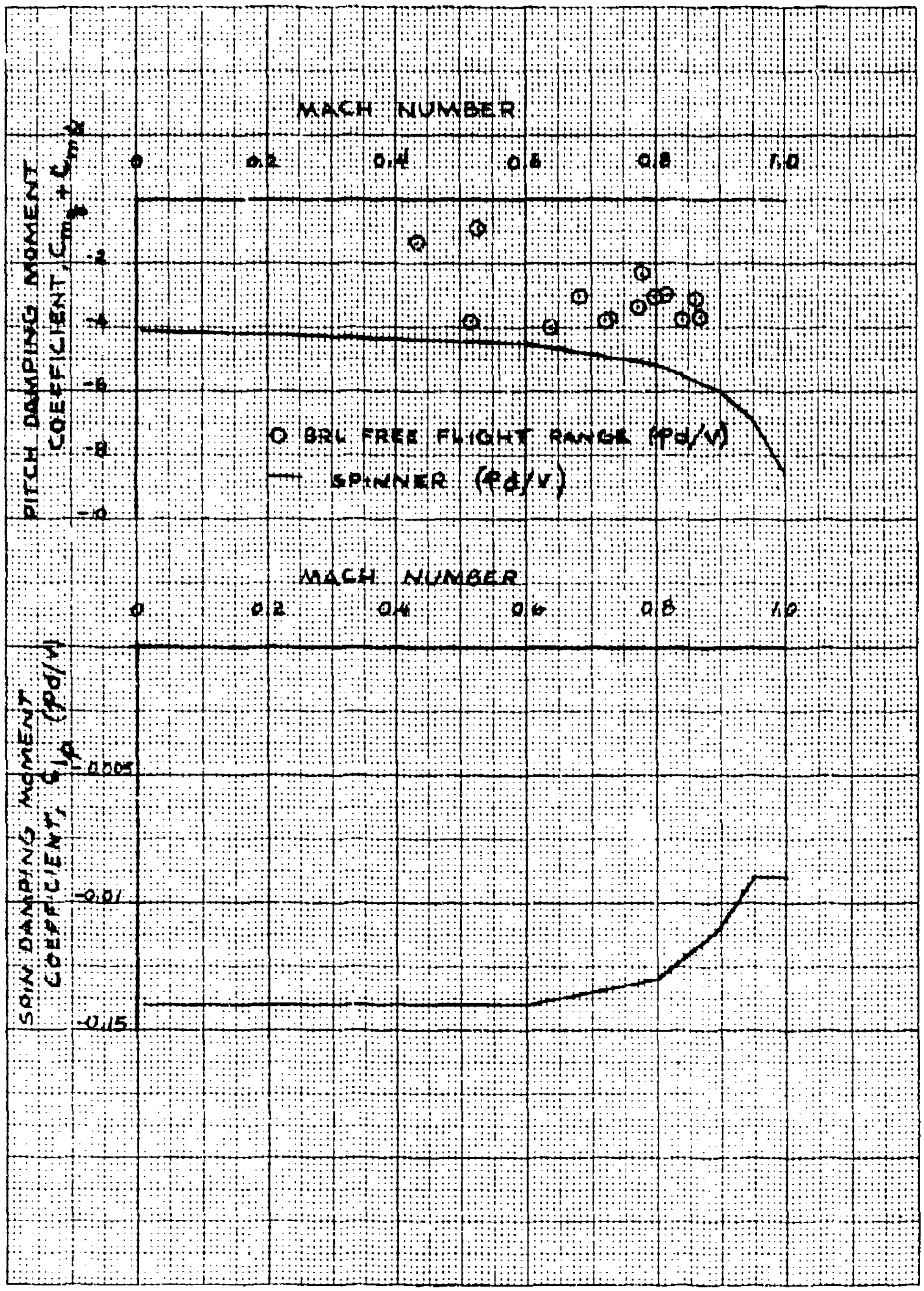


Fig 380 Pitch damping coefficient and spin damping coefficient vs Mach No.

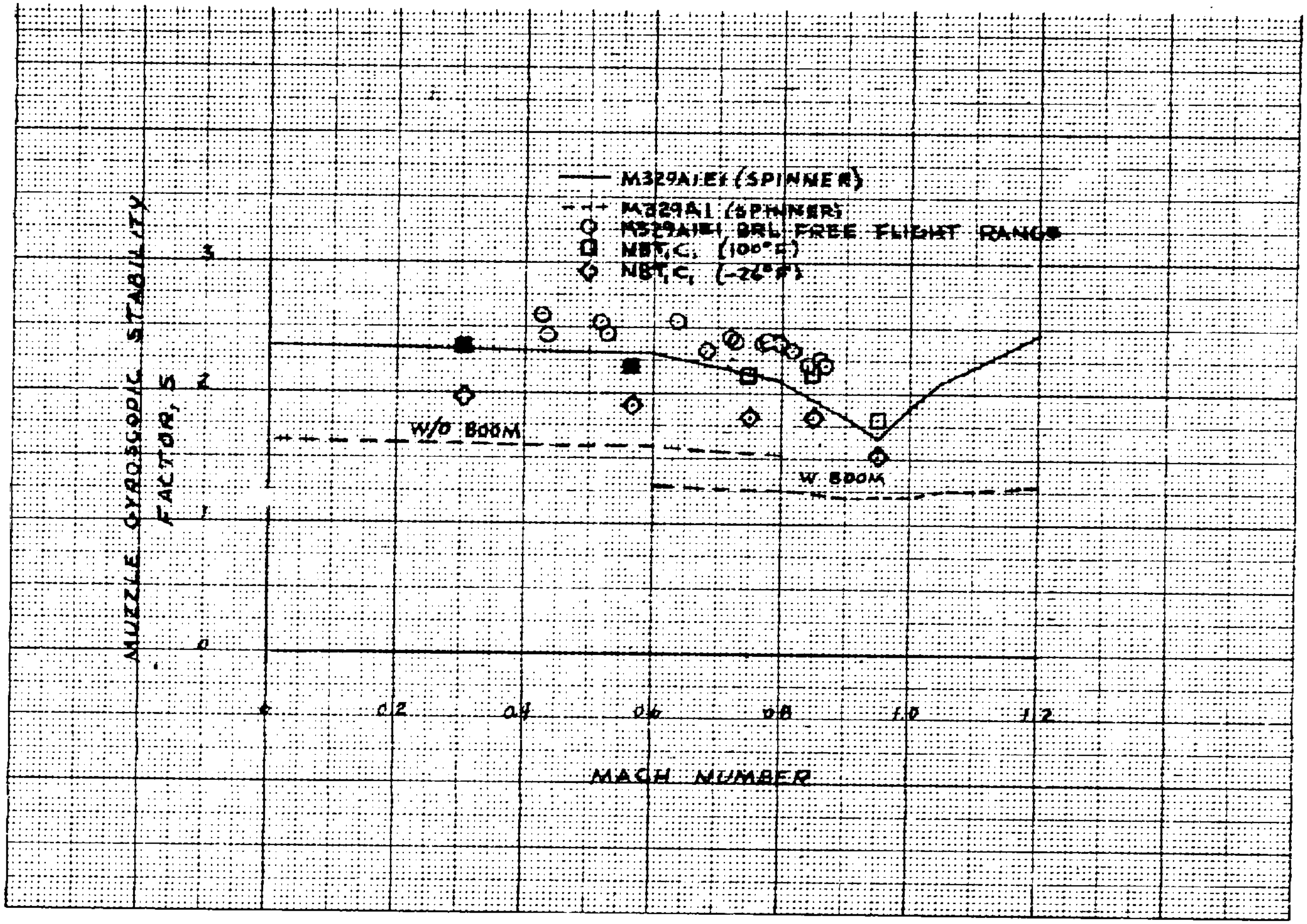


Fig 381 Muzzle gyroscopic stability factors vs Mach No.

Figures 382 through 386

Damping factors vs angle of attack for configuration NBT_1C_1 at various Mach numbers

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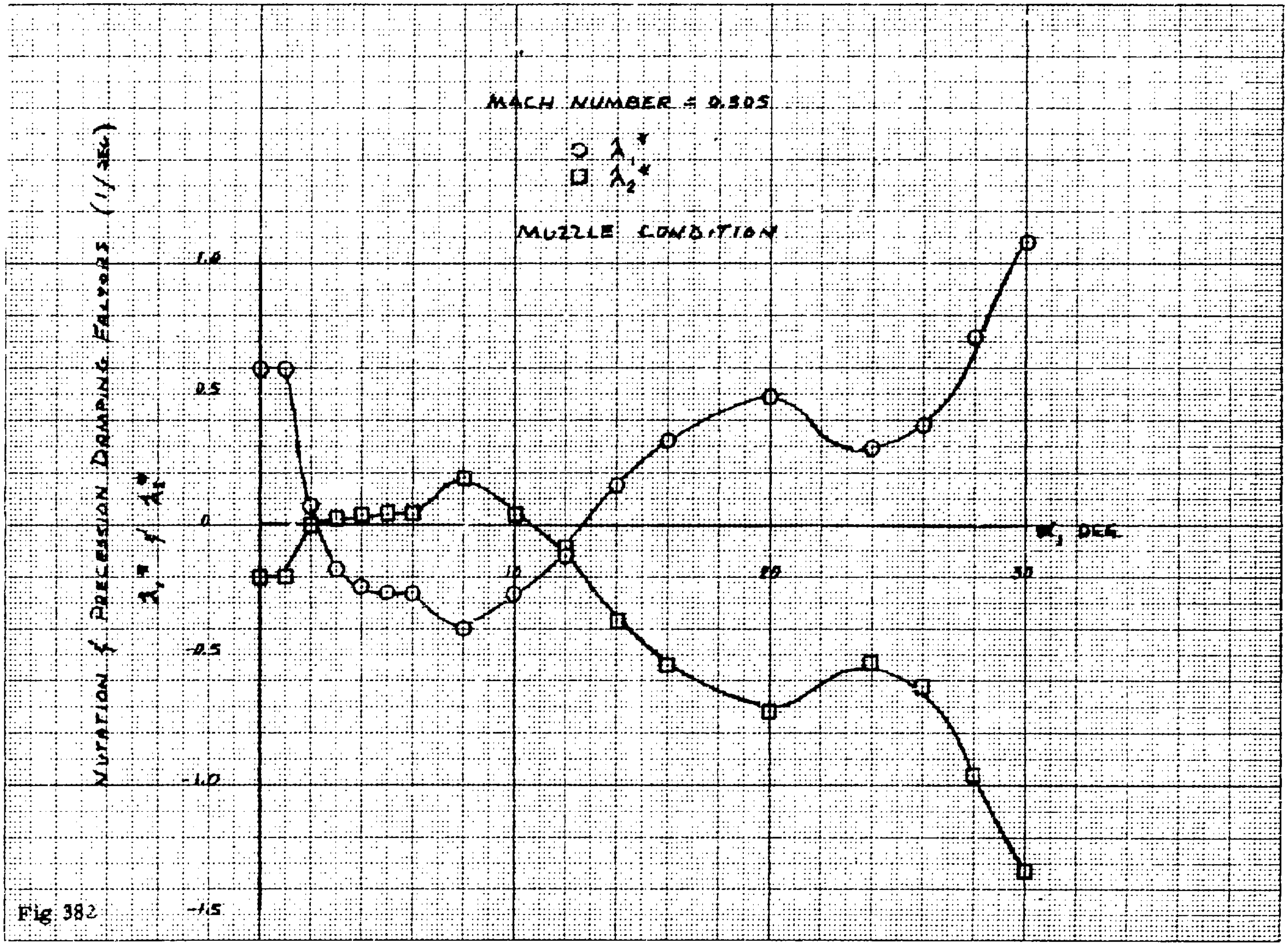

MACH NUMBER = 0.305
λ₁*
λ₂*
MUZZLE CONDITION
NUTATION & PRECESSION DAMPING FACTORS (1/SEC)
1.0
0.5
0
-0.5
-1.0
-1.5
10
20
30
DEG

Fig. 382

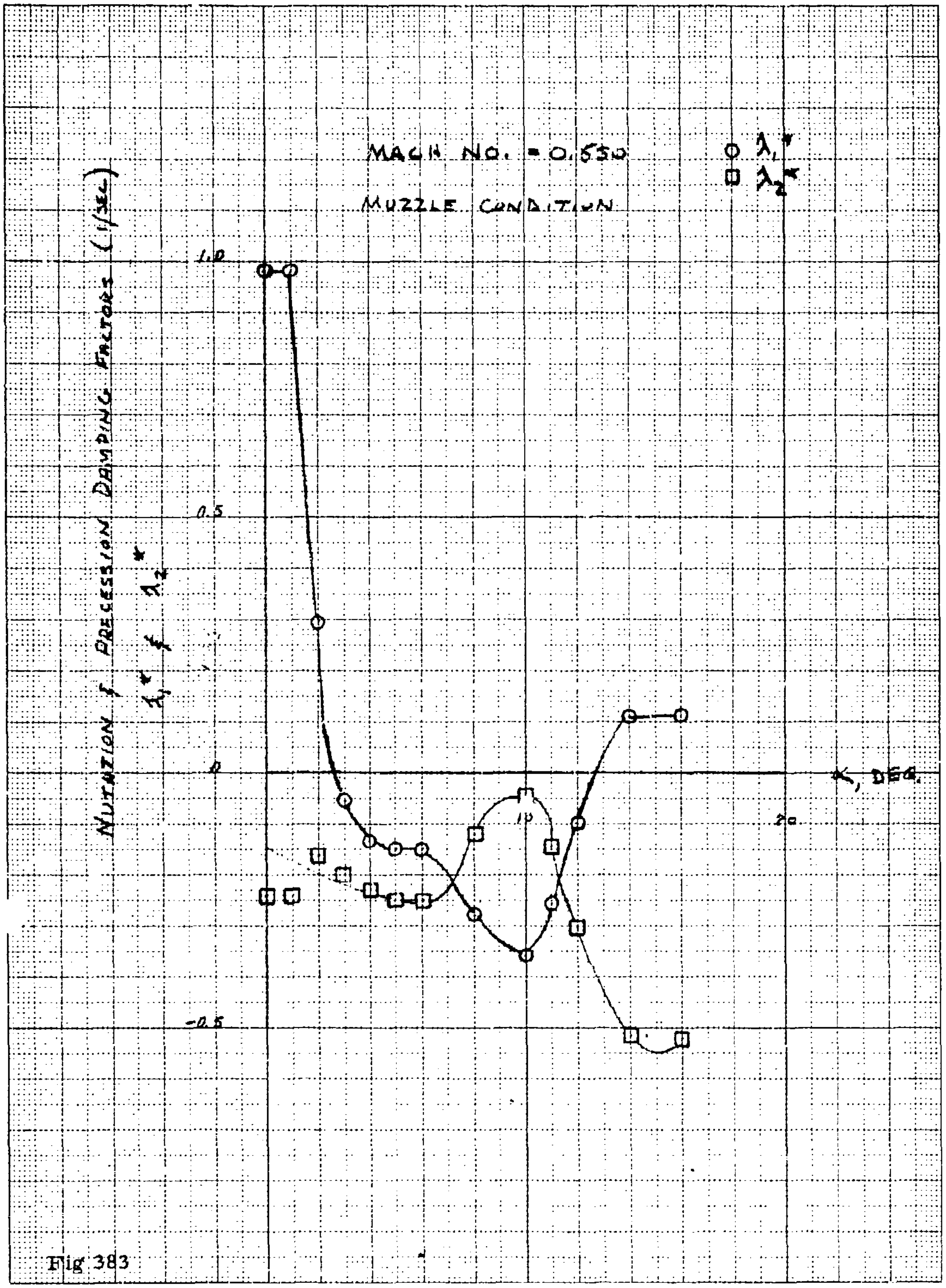

MACH NO. = 0.550
MUZZLE CONDITION
λ_1^*
λ_2^*
NUTATION & PRECESSION DAMPING FACTORS (1/SEC)
λ_1^* & λ_2^*
1.0
0.5
0
-0.5
10
20
α, DEG.

Fig 383

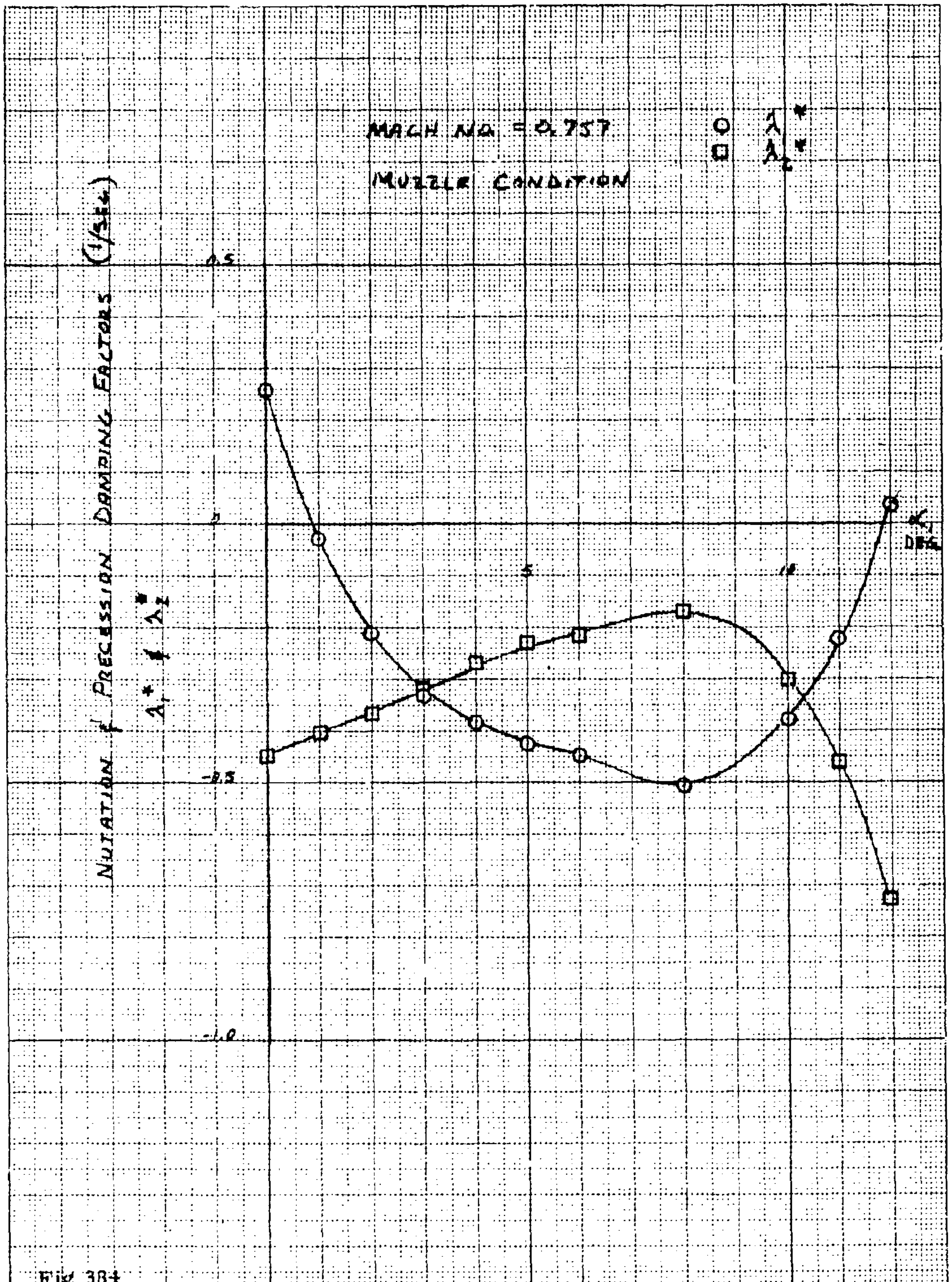

MACH NO = 0.757
MUZZLE CONDITION
○ λ_1^*
□ λ_2^*
NUTATION & PRECESSION DAMPING FACTORS (1/SEC)
λ_1^* & λ_2^*
0.5
0
-0.5
-1.0
5
10
α_1 DEG

Fig 384

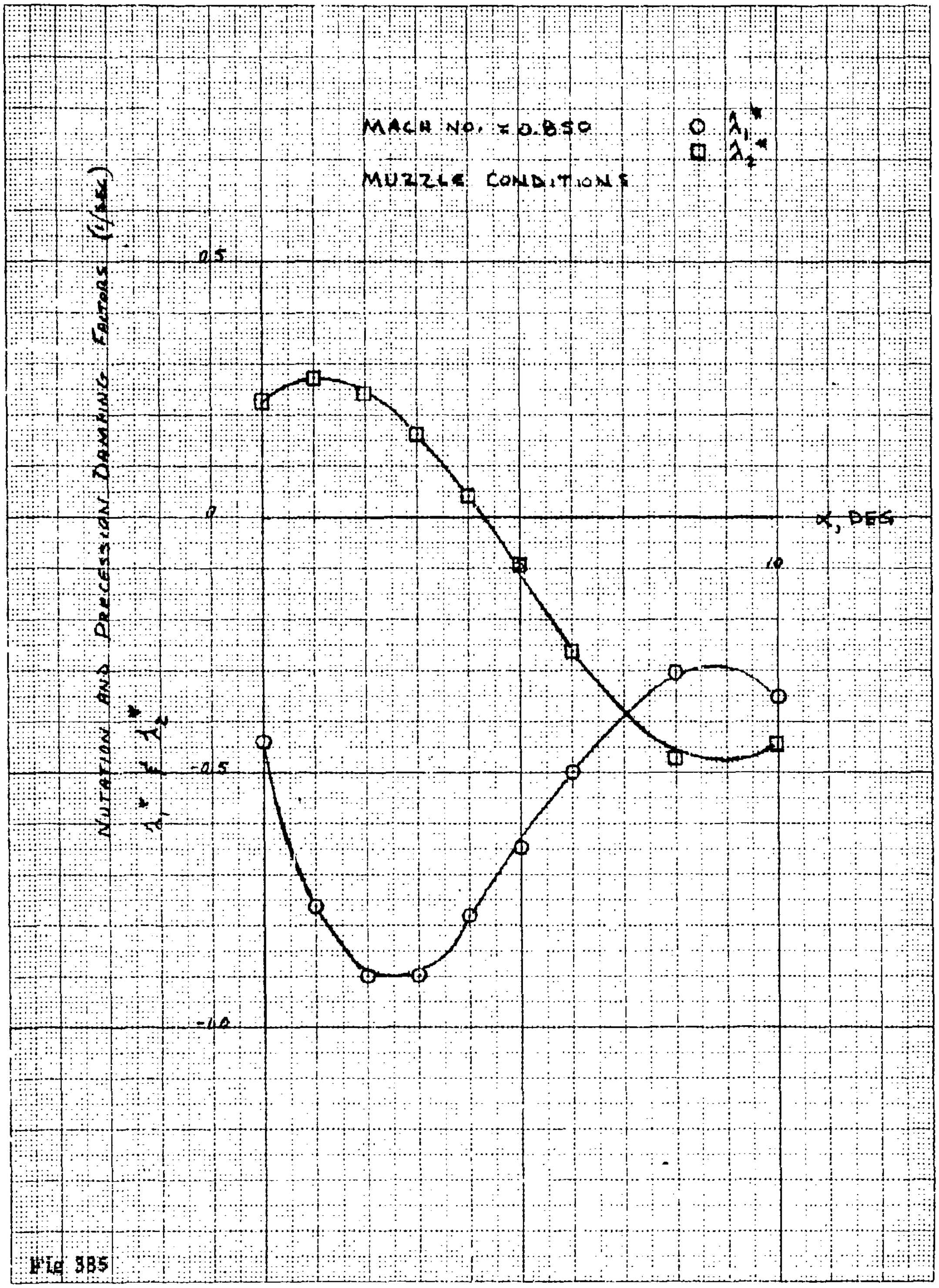

MACH NO. = 0.850
MUZZLE CONDITIONS
λ_1^*
λ_2^*
NUTATION AND PRECESSION DAMPING FACTORS (1/SEC)
λ_1^* & λ_2^*
0.5
0
-0.5
-1.0
10
α, DEG

Fig 385

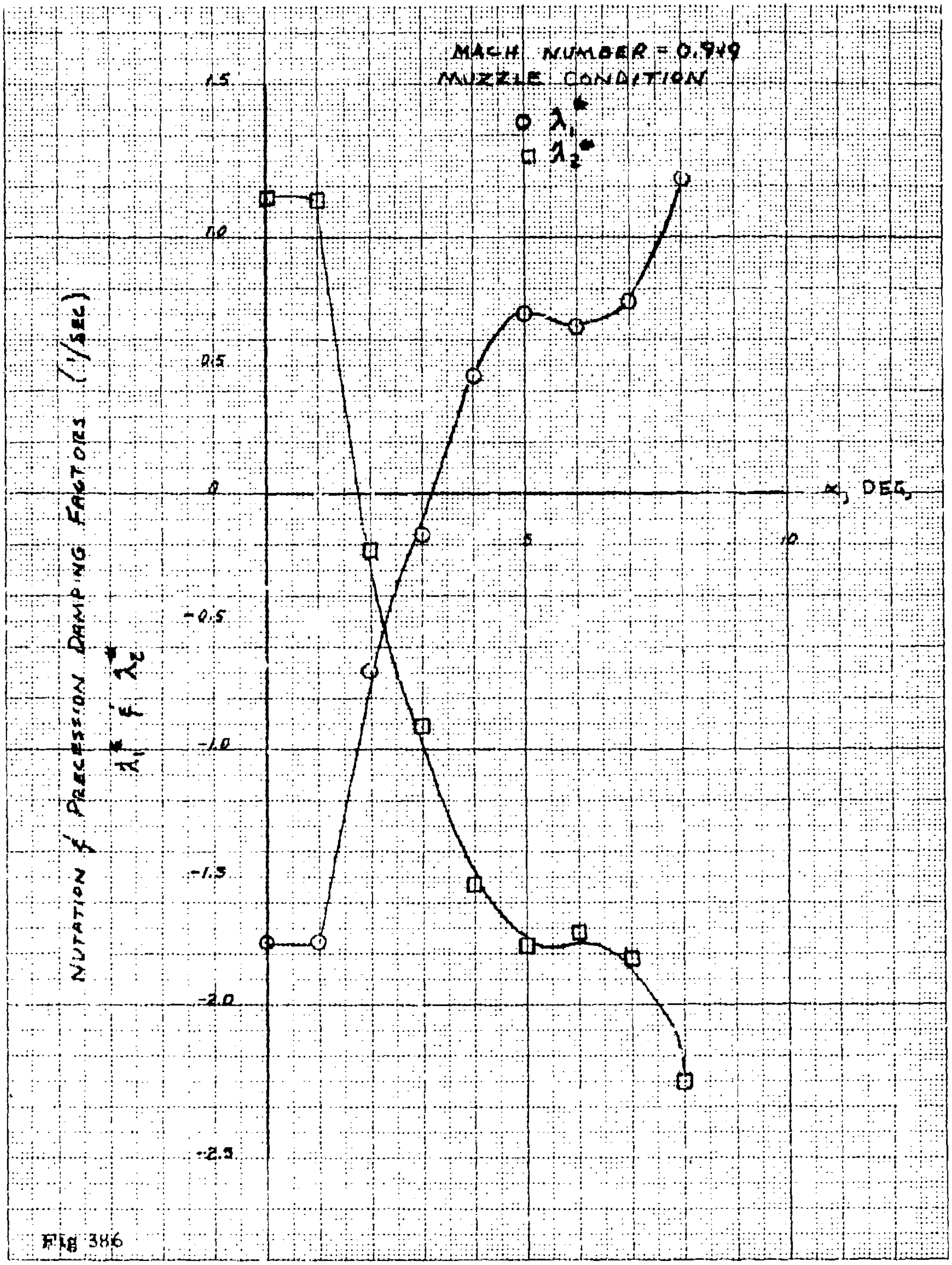
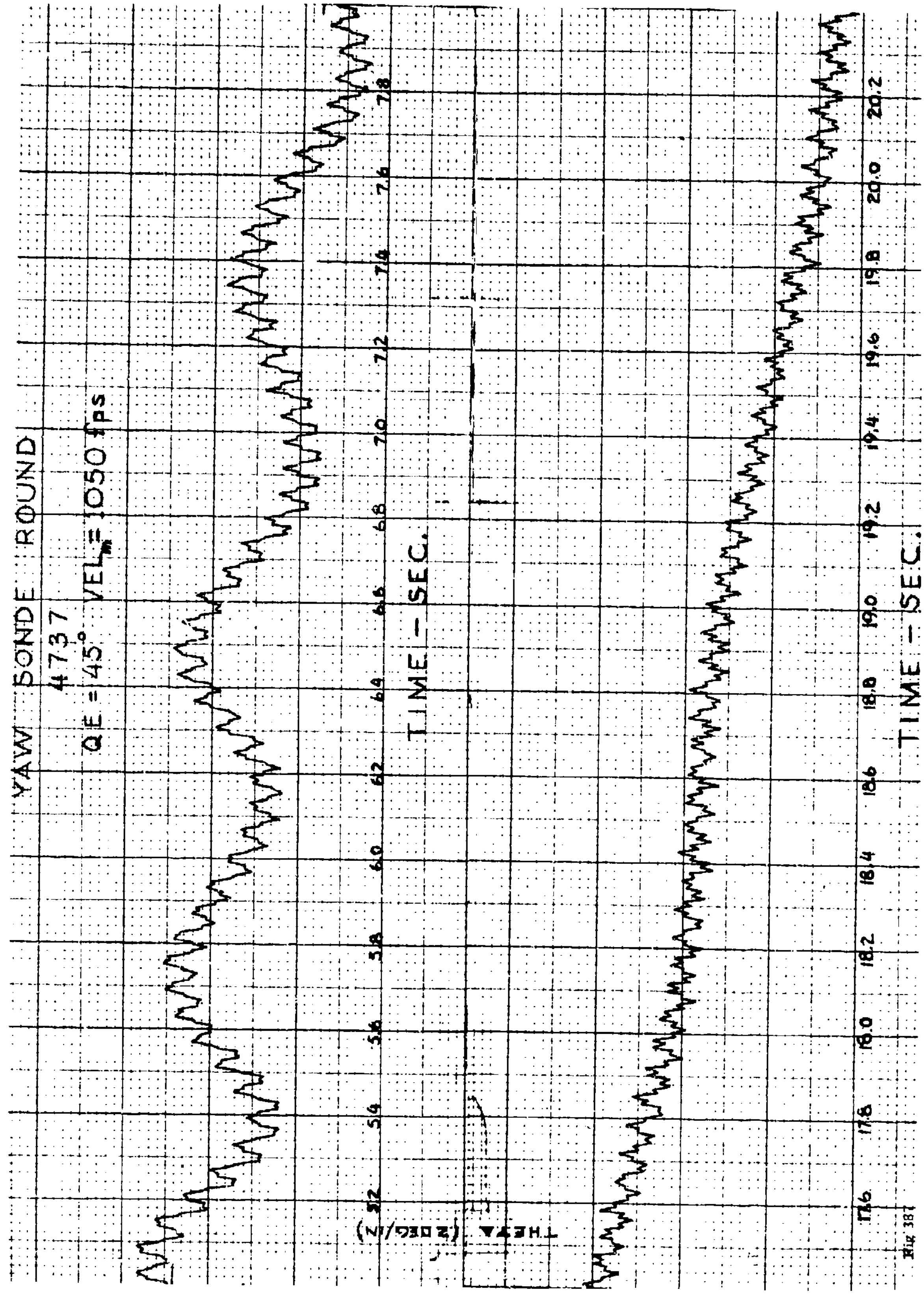
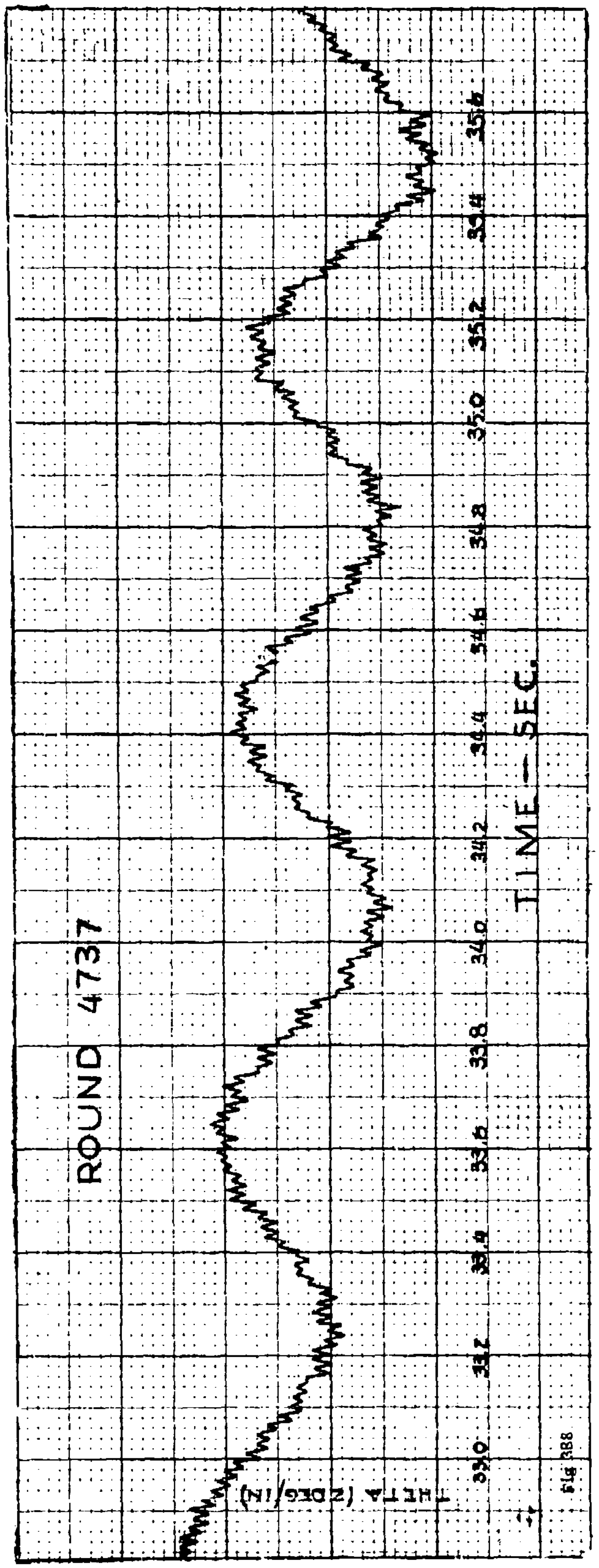

MACH NUMBER = 0.949
MUZZLE CONDITION
λ₁*
λ₂*
NUTATION & PRECESSION DAMPING FACTORS (1/SEC)
λ₁* & λ₂*
α, DEG.
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
-2.5
5
10

Fig 386

Figures 387 and 388

Solar aspect angle vs time of flight for M329A1E1 yaw sonde Round No. 4737


YAW SONDE ROUND
4737
QE = 45° VEL = 1050 fps
TIME - SEC.
TIME - SEC.
5.2 5.4 5.6 5.8 6.0 6.2 6.4 6.6 6.8 7.0 7.2 7.4 7.6 7.8
17.6 17.8 18.0 18.2 18.4 18.6 18.8 19.0 19.2 19.4 19.6 19.8 20.0 20.2
THETA (2 DEG/IN)


ROUND 4737
TIME — SEC.
33.0
33.2
33.4
33.6
33.8
34.0
34.2
34.4
34.6
34.8
35.0
35.2
35.4
35.6
THETA (2DEG/IN)
fig 388

Figures 389 and 390

Solar aspect angle vs time of flight for M329A1E1 yaw sonde Round No. 4739

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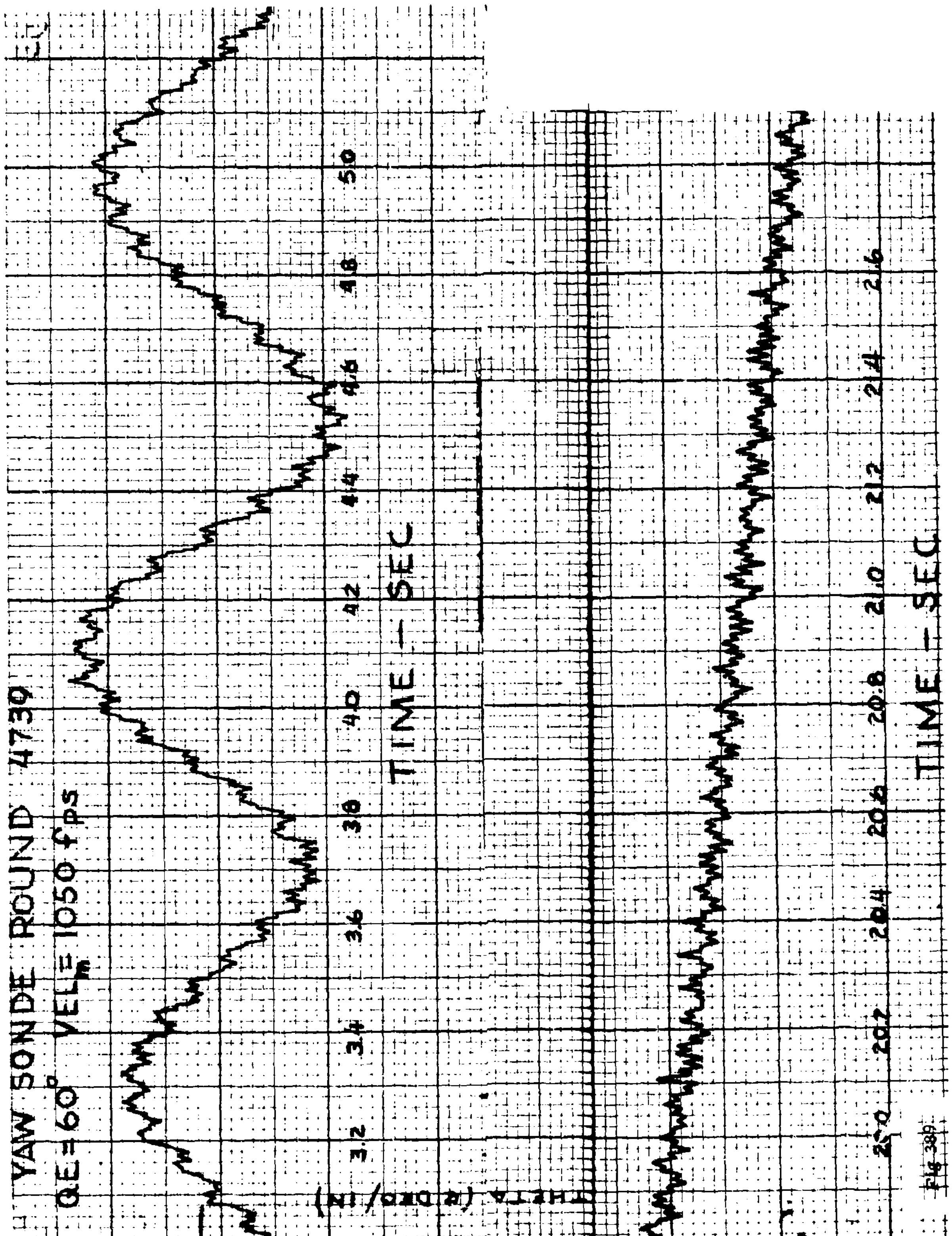
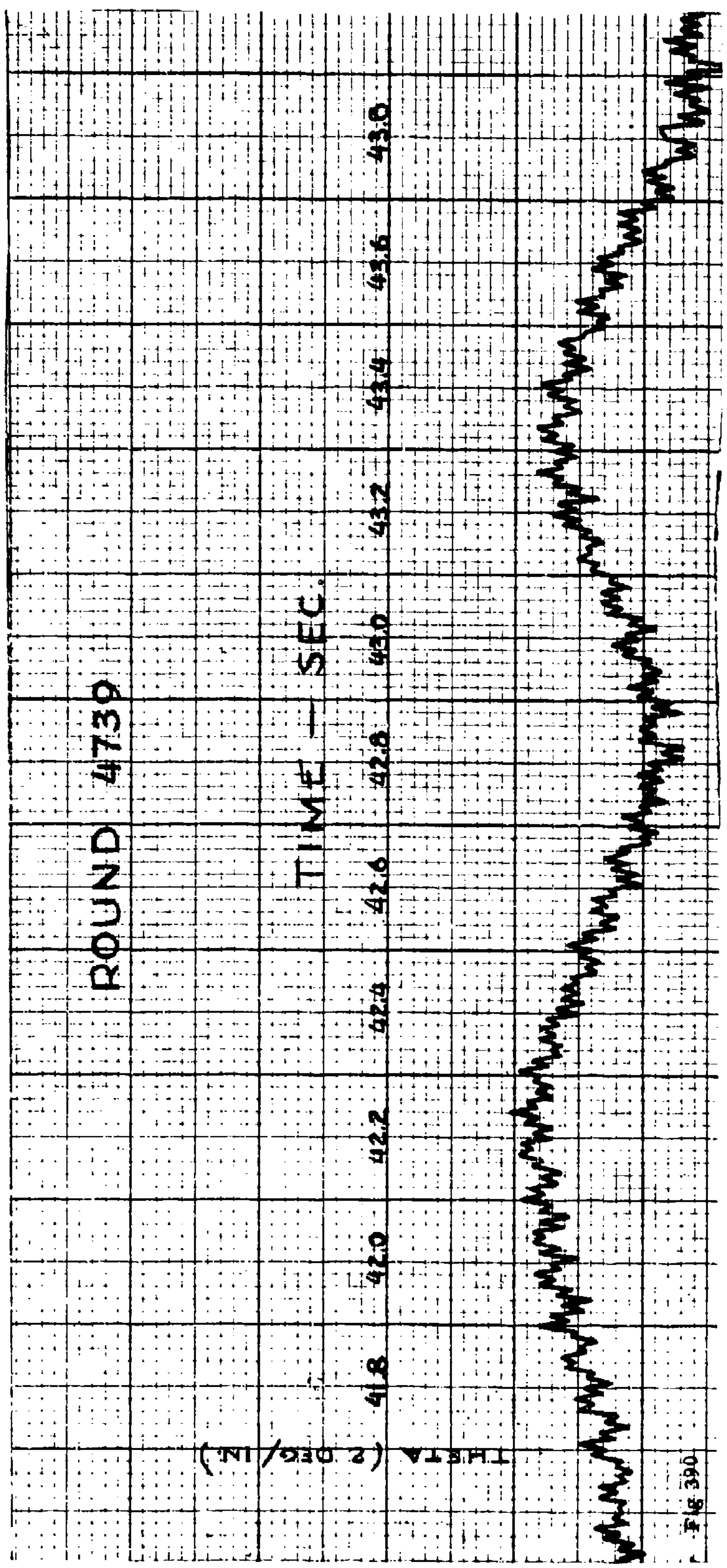
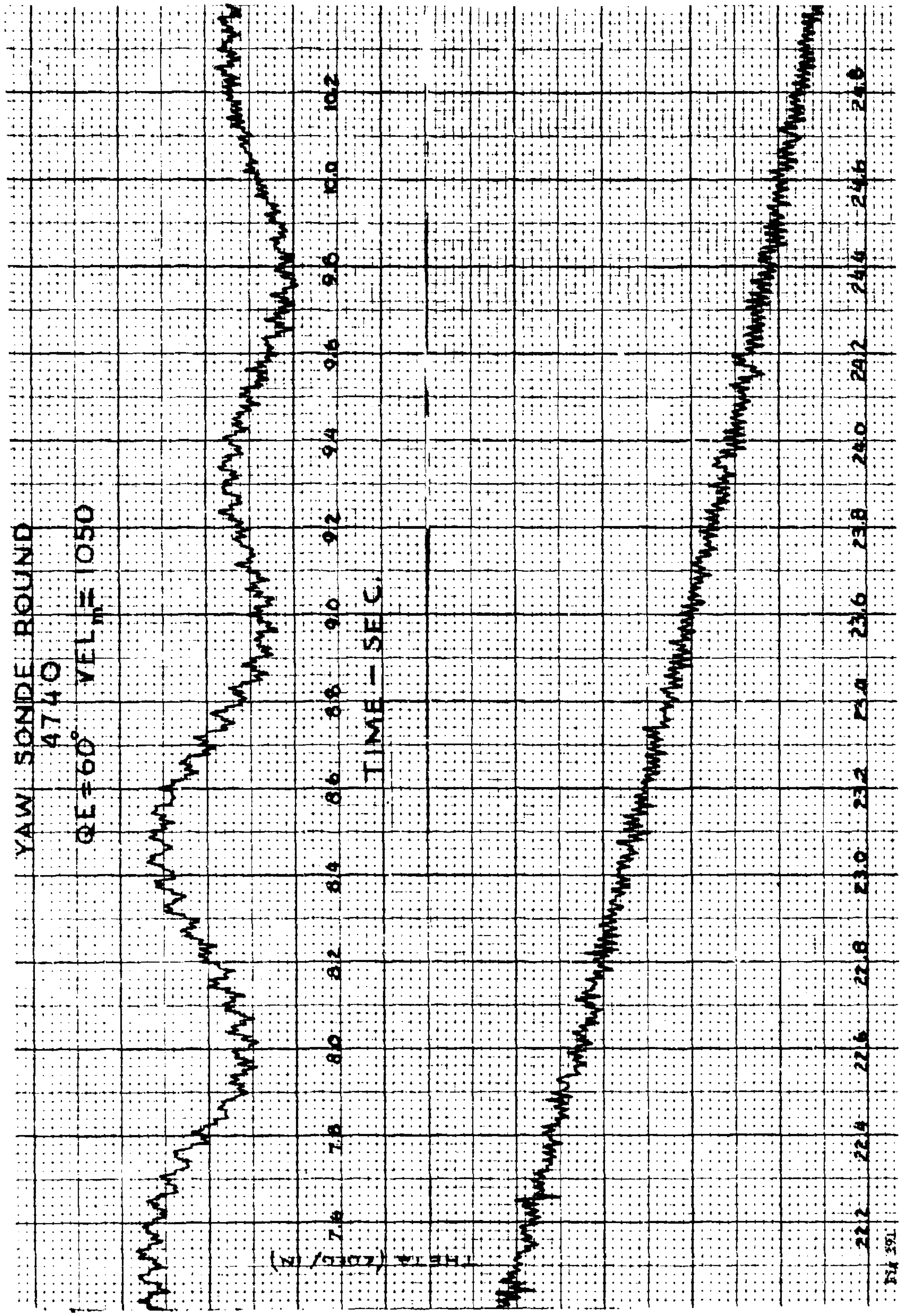

YAW SONDE ROUND 4730
QE = 60° VEL = 1050 fps
TIME — SEC
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
TIME — SEC
20.0
20.2
20.4
20.6
20.8
21.0
21.2
21.4
21.6
Fig 389


ROUND 4739
TIME — SEC.
41.8
42.0
42.2
42.4
42.6
42.8
43.0
43.2
43.4
43.6
43.8
THETA (2 DEG/IN.)
Fig 390

Figures 391 and 392

Solar aspect angle vs time of flight for M329A1E1
yaw sonde Round No. 4740


YAW SONDE ROUND
4740
QE = 60°   VEL$_m$ = 1050
TIME — SEC.

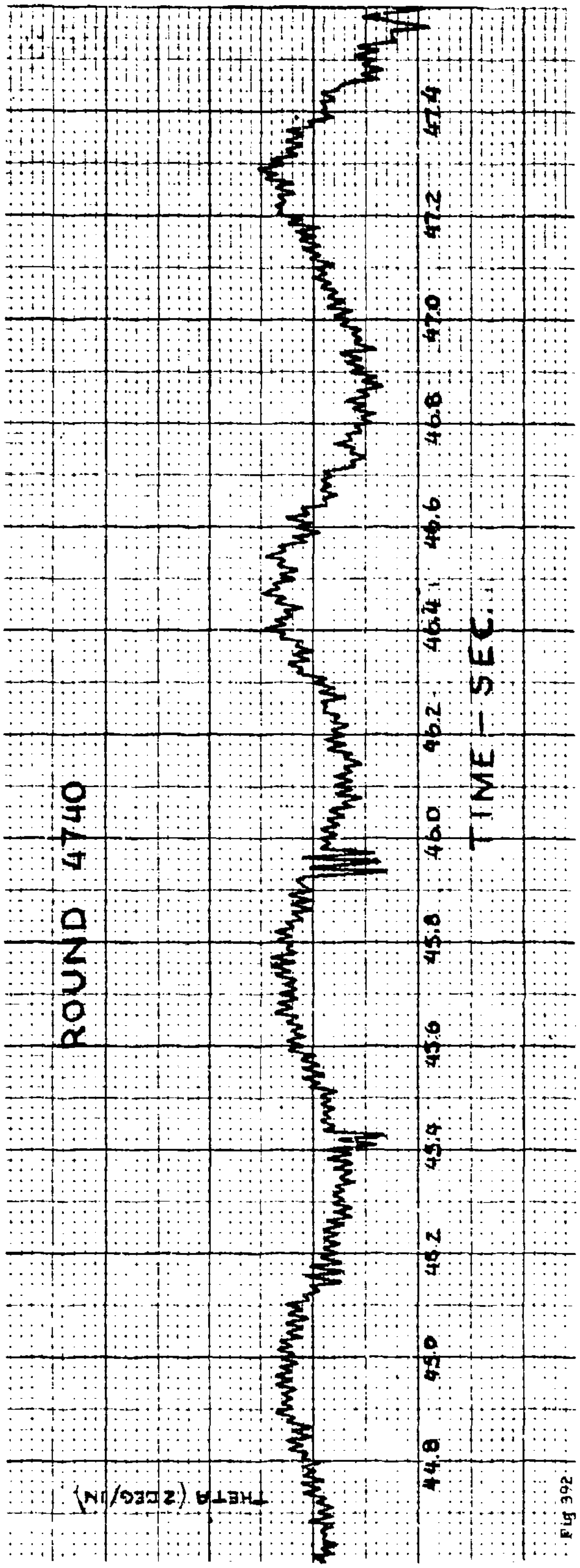

ROUND 4740
THETA (2 DEG/IN)
TIME - SEC.
44.8
45.0
45.2
45.4
45.6
45.8
46.0
46.2
46.4
46.6
46.8
47.0
47.2
47.4

Fig 392